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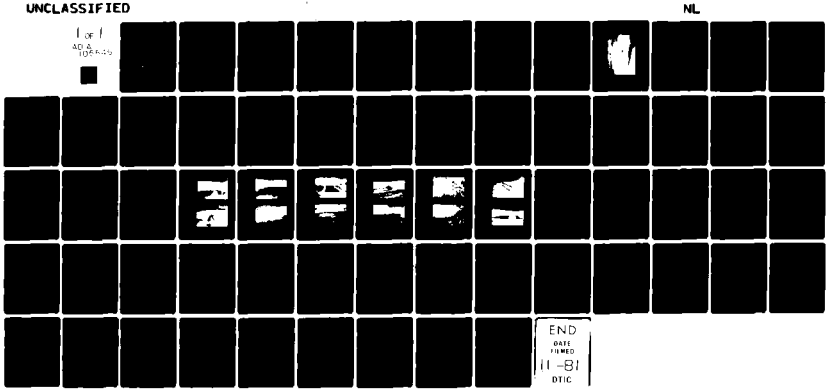

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MISSISSIPPI - KASKASKIA - ST. LOUIS BASIN

ALLGEYER LAKE DAM

MONTGOMERY COUNTY, MISSOURI

MO. 30376

PHASE 1 INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

United States Army
Corps of Engineers
...Serving the Army
...Serving the Nation

St. Louis District

PREPARED BY: U.S. ARMY ENGINEER DISTRICT, ST. LOUIS

FOR: STATE OF MISSOURI

JUNE, 1979

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER

2. GOVT ACCESSION NO. AD-A105545

3. RECIPIENT'S CATALOG NUMBER

4. TITLE *(and Subtitle)*
Phase I Dam Inspection Report
National Dam Safety Program
Allgeyer Lake Dam (MO 30376)
Montgomery County, Missouri

5. TYPE OF REPORT & PERIOD COVERED
Final Report

6. PERFORMING ORG. REPORT NUMBER

7. AUTHOR(s)
Hoskins-Western-Sonderegger, Inc.
Rey S. /Decker Gordon /Jamison
Garold /Ulmer Harold P. /Hoskins

8. CONTRACT OR GRANT NUMBER(s)
DACW43-79-C-0046

9. PERFORMING ORGANIZATION NAME AND ADDRESS
U.S. Army Engineer District, St. Louis
Dam Inventory and Inspection Section, LMSED-PD
210 Tucker Blvd., North, St. Louis, Mo. 63101

10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS

11. CONTROLLING OFFICE NAME AND ADDRESS
U.S. Army Engineer District, St. Louis
Dam Inventory and Inspection Section, LMSED-PD
210 Tucker Blvd., North, St. Louis, Mo. 63101

12. REPORT DATE
June 1979

13. NUMBER OF PAGES
Approximately 54

14. MONITORING AGENCY NAME & ADDRESS *(if different from Controlling Office)*
National Dam Safety Program. Allgeyer Lake Dam (MO 30376), Mississippi - Kaskaskia - St. Louis Basin, Montgomery County, Missouri. Phase I Inspection Report.

15. SECURITY CLASS. *(of this report)*
UNCLASSIFIED

15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT
Approved for release; distribution unlimited.

17. DISTRIBUTION STATEMENT *(of the abstract entered in Block 20, if different from Report)*

18. SUPPLEMENTARY NOTES

19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*
Dam Safety, Lake, Dam Inspection, Private Dams

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*
This report was prepared under the National Program of Inspection of Non-Federal Dams. This report assesses the general condition of the dam with respect to safety, based on available data and on visual inspection, to determine if the dam poses hazards to human life or property.

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SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

ALLGEYER LAKE DAM

MONTGOMERY COUNTY, MISSOURI

MISSOURI IDENTIFICATION NO. 30376

PHASE I INSPECTION REPORT

NATIONAL DAM SAFETY PROGRAM

PREPARED BY
HOSKINS-WESTERN-SONDEREGGER, INC.
CONSULTING ENGINEERS
LINCOLN, NEBRASKA

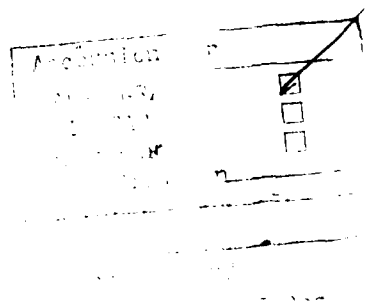
UNDER DIRECTION OF

ST. LOUIS DISTRICT, CORPS OF ENGINEERS

FOR

GOVERNOR OF MISSOURI

JUNE, 1979



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DEPARTMENT OF THE ARMY
ST. LOUIS DISTRICT, CORPS OF ENGINEERS
210 NORTH 12TH STREET
ST. LOUIS, MISSOURI 63101

IN REPLY REFER TO

SUBJECT: Allgeyer Lake Dam Phase I Inspection Report

This report presents the results of field inspection and evaluation of tne Allgeyer Lake Dam.

It was prepared under the National Program of Inspection of Non-Federal Dams.

This dam has been classified as unsafe, non-emergency by the St. Louis District as a result of the application of the following criteria:

1) Spillway will not pass 50 percent of the Probable Maximum Flood.
2) Overtopping could result in dam failure.
3) Dam failure significantly increases the hazard to loss of life downstream.

SUBMITTED BY SIGNED 19 MAR 1980
Chief, Engineering Division Date

APPROVED: SIGNED 19 MAR 1980
Colonel, CE, District Engineer Date

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

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APPENDIX D - HYDRAULIC AND HYDROLOGIC DATA

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
ASSESSMENT SUMMARY

Name of Dam	Allgeyer Lake Dam
State Located	Missouri
County Located	Montgomery County
Stream	Tributary Dry Fork
Date of Inspection	June 26, 1979

Allgeyer Lake Dam was inspected by an interdisciplinary team of engineers from Hoskins-Western-Sonderegger, Inc. The purpose of the inspection was to make an assessment of the general condition of the dam with respect to safety, based upon available data and visual inspection, in order to determine if the dam poses hazards to human life or property.

The guidelines used in the assessment were furnished by the Department of the Army, Office of the Chief of Engineers, and developed with the help of several Federal and State agencies, professional engineering organizations, and private engineers. Based on these guidelines, this dam is classified as a small size dam with a high downstream hazard potential. Failure would threaten life and property. The estimated damage zone extends approximately two miles downstream of the dam. Within the damage zone are 3 to 4 dwellings in the Village of Americus and two crossings of Highway "P".

Our inspection and evaluation indicates that the spillways do not meet the criteria set forth in the recommended guidelines for a small dam having a high hazard potential. Considering the small volume of water impounded and the large floodplain downstream one-half of the Probable Maximum Flood is the appropriate spillway design flood. The spillways will not pass the 100-year flood (flood having a one percent chance of being exceeded in any year) without overtopping the dam. The spillways will pass 7% of the Probable Maximum Flood without overtopping the dam. The Probable Maximum Flood (PMF) is defined as the flood that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in the region.

No design data were available for this dam. Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available, which is considered a deficiency. These analyses should be obtained in the future.

Other deficiencies observed during the inspection are: small trees growing on the upstream and downstream slopes; potholes and ponding water on the dam crest; the lack of a trash rack on the riser of the principal spillway; the construction of a culvert and roadway across the emergency spillway; and the badly overgrown condition of trees and brush around the principal spillway outlet and the downstream channel.

Items of preventative maintenance need to be initiated by the owner as described in more detail in the body of the report.

Rey S. Decker
E-3703

Gordon Jamison

Garold Ulmer
E-4777

Harold P. Hoskins
Chairman of Board
Hoskins-Western-Sonderegger, Inc.
E-8696

PHOTO NO. 1 - OVERVIEW

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
ALLGEYER LAKE DAM - MO 30376
MONTGOMERY COUNTY, MISSOURI

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority. The National Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of safety inspection of dams throughout the United States. Pursuant to the above, the St. Louis District, Corps of Engineers, District Engineer directed that a safety inspection of Allgeyer Lake Dam be made.

b. Purpose of Inspection. The purpose of the inspection was to make an assessment of the general condition of the dam with respect to safety, based upon available data and visual inspection, in order to determine if the dam poses hazards to human life or property.

c. Evaluation Criteria. Criteria used to evaluate the dam were furnished by the Department of the Army, Office of the Chief of Engineers, in "Recommended Guidelines for Safety Inspection of Dams", Appendix D to "Report of the Chief of Engineers on the National Program of Inspection of Dams", dated May, 1975, and published by the Department of the Army, Office of the Chief of Engineers.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances.

(1) The dam is an earth fill approximately 530 feet in length and about 28.7 feet in height. Topography of the area is moderately rolling with moderately steep, narrow valleys.

(2) The principal spillway consists of a 12" corrugated metal pipe riser with 12" diameter corrugated metal pipe conduit passing through the embankment. Two anti-seep collars are shown on the plans.

(3) A vegetated earth emergency spillway is cut through the left abutment.

(4) Pertinent physical data are given in paragraph 1.3 below.

b. Location. The dam is located in the southwest corner of Montgomery County, Missouri, as shown on Plate A-2. The dam is shown on Plate A-1 in the NW¼ of Section 14, T46N, R6W. The lake formed behind the dam is shown in the NW¼ of Section 14, T46N, R6W.

c. Size Classification. Criteria for determining the size classification of dams and impoundments are presented in the guidelines referenced in paragraph 1.1c above. Based on these criteria, this dam and impoundment is in the small size category.

d. Hazard Classification. Guidelines for determining hazard classification are presented in the same guidelines as referenced in paragraph 1.1c above. Based on these guidelines, this dam is in the High Hazard Classification. The estimated damage zone extends approximately two miles downstream of the dam. Within the damage zone are 3 or 4 dwellings in the Village of Americus and two crossings of Highway "P".

e. Ownership. The dam is owned by Edward E. Allgeyer, R.R. No. 3, Hermann, MO 65041.

f. Purpose of Dam. The dam impounds a recreational lake covering about 5 acres.

g. Design and Construction History. Very limited design information was supplied by the Soil Conservation Service, Columbia, MO. The first plans for the dam, dated 1963, show top of dam at elevation 100.8 and principal spillway at elevation 96. Prior to construction, Mr. Allgeyer requested that the plans be revised to provide a larger reservoir. The revised plans, dated 1965, are shown in Appendix C. The original plans, not included, are essentially the same as shown in Appendix C except for a lower dam. According to this information the dam was constructed in 1966. Mr. Allgeyer stated that a foundation cutoff trench was excavated to depths of 25 feet or more to intercept gravel strata toward the left abutment, and material for the dam was borrowed largely from the left abutment and slopes adjacent to the reservoir area. These soils were observed to be CL-CH materials.

h. Normal Operating Procedure. There are no operating facilities for this dam.

1.3 PERTINENT DATA

a. Drainage Area. 96.9 acres (0.15 square miles).

b. Discharge at Damsite.

(1) All discharges at the damsite are through an uncontrolled 12" CMP riser and conduit principal spillway, and an 18" uncontrolled CMP culvert emergency spillway placed in an embankment blocking the old earthen channel spillway.

(2) Estimated maximum flood at damsite -- shortly after construction was completed, a 15" rain caused water to rise within approximately one foot of top of dam (culvert not in place in spillway at time of flood).

(3) The principal spillway capacity varies from 0 cfs at elevation 756.6 feet to 0.4 cfs at the crest of the emergency spillway (elevation 757.0 feet) and to 6.2 cfs at the minimum top of dam (elevation 759.7 feet).

(4) The emergency spillway capacity varies from 0 cfs at its crest elevation 757.0 feet to 10 cfs at elevation 759.7 feet (minimum top of dam).

(5) Total spillway capacity at the minimum top of dam is 16 cfs ±.

c. Elevations (feet above M.S.L.).

(1) Top of dam - 759.7 (low point)
(2) Principal spillway crest - 756.6 (spillway riser notch)
(3) Emergency spillway crest 757.0 (culvert invert)
(4) Streambed at centerline - 731 ±
(5) Maximum tailwater - unknown

d. Reservoir. Length (feet) of maximum pool - 1,000 ±.

e. Storage (Acre-feet).

(1) Principal spillway to top of dam - 15 ±
(2) Emergency spillway - 43 ±
(3) Principal spillway - 43 ±

f. Reservoir Surface (Acres).

(1) Top of dam - 7.5 ±
(2) Principal spillway crest - 5 ±

g. Dam.

(1) Type - earth fill
(2) Length - 530 feet ±
(3) Height - 28.7 feet ±
(4) Top width - 11 feet
(5) Side Slopes.
    (a) Downstream - plans show 2H on 1V; measured = 1.8/2.4 H on 1V
    (b) Upstream - plans show 3H on 1V; measured 2.5H on 1V exposed.
(6) Zoning - unknown
(7) Impervious core - unknown
(8) Cutoff - reported by Mr. Allgeyer to be constructed with 10 foot bottom width, 1H on 1V side slopes and depth of 4 to 25 feet.
(9) Grout curtain - unknown
(10) Wave protection - none
(11) Internal drainage - unknown

h. Diversion Channel and Regulating Tunnel. None

i. Spillway.

(1) Principal
    (a) Type - uncontrolled, corrugated metal pipe, 12 inch diameter riser with 12 inch diameter conduit passing through the embankment.
    (b) Crest (invert) elevation of notch - 756.6 feet ± Outlet - 730.7 feet ±
    (c) Length - 108 feet ±

(2) Emergency
    (a) Type - uncontrolled, vegetated earth cut through left abutment.
    (b) Control section - consists of an 18 inch CMP culvert placed through the roadway crossing the spillway.
    (c) Crest elevation - 757 feet
    (d) Upstream Channel - vegetated earth
    (e) Downstream Channel - vegetated earth on 3% slope

j. Regulating Outlets. The only regulating outlet is an insignificant drawdown facility consisting of a 4 inch steel pipe reduced to a 1 inch pipe with valve at the outlet end.

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

Limited data were available for this dam from the Soil Conservation Service, Columbia, MO. These are included with this report in Appendix C. The dam was originally designed with a maximum height of 20 feet. At the time of construction, it was decided by the owner to increase the height of the dam.

2.2 CONSTRUCTION

The only construction data available were some construction stake out notes, shown in Appendix C. These notes show the unsettled top of dam at assumed elevation of 107.5 feet ± which would be estimated M.S.L. elevation 760.8 feet.

2.3 OPERATION

No data were available on spillway operation. It was reported by Mr. Allgeyer that shortly after the dam was built, a 15 inch rain in the area produced a flow of 2 feet or more in the emergency spillway (reservoir was within one foot ± of the top of dam). However, this flow condition was prior to placement of the road culvert in the spillway.

2.4 EVALUATION

a. Availability. The available data were secured from the State Office of the Soil Conservation Service, Columbia, MO.

b. Adequacy. The available data, the field surveys and visual observations presented herein are considered adequate to support the conclusions of this report. Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available, which is considered a deficiency. These seepage and stability analyses should be performed for appropriate loading conditions (including earthquake loads) and made a matter of record.

c. Validity. The data are applicable to this dam.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General. A visual inspection of the Allgeyer Dam was made on June 26, 1979. Engineers from Hoskins-Western-Sonderegger, Inc., Lincoln, Nebraska making the inspection were: R.S. Decker, Geotechnical; Gordon Jamison, Hydrology; Garold Ulmer, Civil Engineer. Mr. Edward Allgeyer accompanied the team on the inspection.

b. Dam.

(1) Geology and Soils (Abutment and embankment). The dam is located in the central Mississippi Valley wooded slope physiographic area. Upland soils consist of thin loessial material over glacial till or limestone. Valley slope materials consist of colluvium from upland loess and/or soils developed from glacial till, limestone, shale or sandstone. Fine grained sandstone is exposed in the right abutment, probably the St. Peter formation of middle Ordovician age. Mr. Allgeyer reported that the sandstone extends into the reservoir area some 100 to 150 feet from the right end of the dam and is at least 40 feet in thickness. No other bedrock formations were exposed in the area of the dam. Materials in the left abutment consist of light yellow brown CL-CH material probably derived from what appeared to be fine grained glacial till. Foundation materials apparently consist of fine grained, unjointed sandstone under the right one-third of the dam, alluvial materials containing gravel strata under the central section and fine grained glacial till under the left end of the dam.

(2) Upstream Slope. The slope is fairly well vegetated with adapted grasses. A few small willows are growing just up from the waterline. No significant erosion was noted. No rodent holes, cracks, or abnormal deformations were observed.

(3) Crest. The crest is covered with cherty gravel and serves as a roadway. A few potholes and ponding water were observed on the crest. Measurements along

the centerline indicate that the center section is about 1.5 feet higher than the ends, probably due to overfill to compensate for settlement which hasn't occurred. No cracks or deformations were observed. The maximum crest elevation of 761.5 feet (measured) is slightly higher than the revised plan elevation of 107.5 (unsettled top) which is equivalent to elevation 760.8 feet.

(4) Downstream Slope. The downstream slope is well vegetated with adapted grasses and sweet clover. A few small cedar and cottonwood trees are growing on the slope. No evidence of seepage on the slope or along the toe was observed. It was reported by Mr. Allgeyer that there was some seep in the right abutment trough when the reservoir first filled (through the sandstone abutment) but it soon stopped. There was no evidence of this seep of the time of inspection. No rodent holes, cracks, or abnormal deformations were noted on the slope or at the toe. The berm near the toe of the slope was added soon after the dam was completed. A small sewage lagoon is located about 150 feet downstream from the right end of the dam. It should not affect the stability nor operation of the dam.

Soils on the downstream slope are plastic CL-CH materials. Measurements indicate that the upper part of the dam is slightly steeper and the lower part flatter than the 2H on 1V planned.

(5) Miscellaneous. The vegetative cover and the nature of materials in the dam would indicate that this structure could withstand considerable overtopping without serious damage.

c. Appurtenant Structures.

(1) The principal spillway consists of a short 12 inch diameter CMP riser attached to a 12 inch CMP conduit. Original plans called for a straight pipe with hooded inlet. No trash guard was present on the inlet riser. The outlet end was about half submerged at the time of inspection. The outlet end of the conduit was apparently extended 12 to 14 feet when the berm

was constructed along the toe of the dam. The riser pipe appears to be quite rusty. No deterioration of the pipe was noted at the lower end. The reservoir level was about 8 inches below the crest of the riser when inspected.

(2) The emergency spillway consists of a vegetated earth channel controlled by an 18 inch diameter CMP culvert through the roadway that crosses the spillway. The roadway and culvert were installed in the spillway a couple of years after the dam was constructed. No erosion was noted in the spillway or exit section. The trash line upstream from the culvert indicated that the reservoir level had been up to or slightly above the invert elevation of the pipe. Discharge from the spillway should not impair the integrity of the dam.

(3) Drawdown Facilities. A 4 inch steel pipe reduced to a 1 inch diameter pipe and valve at the outlet end passes through the base of the dam. The valve is operable and Mr. Allgeyer reported that the line would drawdown the reservoir level about 1 inch per day.

d. Reservoir Area. No slides were observed nor significant erosion noted around the shoreline of the reservoir. Upstream from the right end of the dam a natural sand beach has been developed for swimming.

e. Downstream Channel. The channel downstream from the principal spillway and the scour hole are badly overgrown with trees and brush. The spillway appears to be stable.

3.2 EVALUATION

This dam appears to be in good shape structurally with no serious potential of failure. Measurements taken during the inspection indicate that it was generally constructed according to the revised plans, except that the principal and emergency spillways were modified and will not operate as planned. The material in the dam and the embankment slopes, with the added downstream berm, should provide adequate safety against shear failure for a dam of this height. The trees should be removed from the embankment slopes.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

The pool level is controlled by rainfall, infiltration, evaporation, and the capacity of the uncontrolled spillways. A very small valve operated drawdown facility will lower the lake level about 1 inch per day (according to the owner).

4.2 MAINTENANCE OF DAM

Maintenance of the dam appears to be fairly good except for tree growth on the slopes, particularly the downstream slope.

4.3 MAINTENANCE OF OPERATING FACILITIES

No operating facilities exist at this dam.

4.4 DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT

There is no warning system in effect for this dam.

4.5 EVALUATION

There does not appear to be any serious potential of failure of this structure.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

a. Design Data. Sketchy plans for this dam were obtained from the Soil Conservation Service, Columbia, Missouri. Spillway conditions found in the field differ considerably from the plans.

b. Experience Data. The drainage area, reservoir surface area, and elevation-storage data were developed from the USGS Americus, Missouri 7 1/2 minute topographic quadrangle map. The hydraulic computations for the spillway and dam overtopping discharge ratings were based on data collected in the field at the time of the field inspection.

c. Visual Observations.

(1) The fill and culvert that have been constructed in the original emergency spillway channel must have a significant effect on the outflow capacity for the reservoir.

(2) Apparently the originally planned hooded inlet for the principal spillway has been replaced with a short riser section.

d. Overtopping Potential. The spillways are too small to pass either the 100-year or one-half probable maximum flood without overtopping. The spillways will pass .07 PMF without overtopping. The spillways will pass the 10-year flood without overtopping. The dam could withstand considerable overtopping without serious damage. The results of the routings through the dam are tabulated in regards to the following conditions.

Frequency	Inflow Discharge cfs	Outflow Discharge cfs	Maximum Pool Elevation	Freeboard Top of Dam Min. Elev. 759.7	Time Dam Overtopping Hr.
10 Yr.	200	13	759.0	+0.7	-
100 Yr.	360	45	760.3	-0.6	8-
0.5 PMF	870	810	761.2	-1.5	12-
PMF	1740	1730	761.7	-2.0	14+
*0.07 PMF	130	16	759.7	0	-

*Percent PMF passed by spillways.

According to the recommended guidelines from the Department of the Army, Office of the Chief of Engineers, this dam is classified as having a high hazard rating and a small size. Therefore, the 1/2 PMF to PMF is the test for the adequacy of the dam and its spillways.

The estimated damage zone is described in Paragraph 1.2d in this report.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observation. This dam appears to be structurally stable. There is no indication of seepage, and the slopes and embankment materials should be safe against shear failure. The effects of overtopping on structural stability are not known, but it would appear that the dam would not be seriously damaged by such an occurrence. Tree growth on the slopes could lead to potential of failure if left uncontrolled.

b. Design and Construction Data. There was not sufficient design or construction data available to assess the structural stability of the dam. Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available, which is considered a deficiency.

c. Operating Records. There are no controlled operating facilities for this dam.

d. Post Construction Changes. The berm at the downstream toe was added after the initial construction of the dam. The emergency spillway was also altered by construction of a roadway with culvert across the control section. The construction plan shows a hooded inlet at the upstream end of the principal spillway instead of the corrugated metal pipe riser with which the spillway is now equipped.

e. Seismic Stability. This dam is located in Seismic Zone 1. An earthquake of the magnitude predicted in this area is not expected to cause structural failure of a dam of this height which is constructed of CL-CH materials.

SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. Safety. This structure looks good and does not appear to have a serious potential of failure. The apparent material in the embankment and the slope parameters should provide adequate structural stability. Analyses presented in Section 5 indicate that the dam will be overtopped 1.5 feet for a period of 12 hours ± by one-half the Probable Maximum Flood. Additional studies would be required to determine the effects of such overtopping on the structural and erosional stability of the dam. Uncontrolled tree growth on the dam could ultimately lead to potential of failure. Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available, which is considered a deficiency.

b. Adequacy of Information. The conclusions in this report are based upon limited design data, performance history and visual observations. Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available, which is considered a deficiency.

c. Urgency. The items recommended in paragraph 7.2a should be pursued on a high priority basis.

d. Necessity for Phase II. Phase II investigation is not considered necessary.

e. Seismic Stability. This dam is located in Seismic Zone 1. An earthquake of this magnitude is not expected to be hazardous to this dam.

7.2 REMEDIAL MEASURES

a. Alternatives.

(1) Additional information should be obtained to determine the effects of the road grade and culvert obstruction in the emergency spillway and to determine the increase in the height of dam or the size of the spillway that is required to pass one-half the Probable Maximum

Flood without overtopping the dam. The services of an engineer experienced in the design and construction of dams should be obtained to evaluate the potential of overtopping and its effects on structural and erosional stability, to provide seepage and stability analyses of the present dam and to design protective measures, if required.

b. O & M Procedures

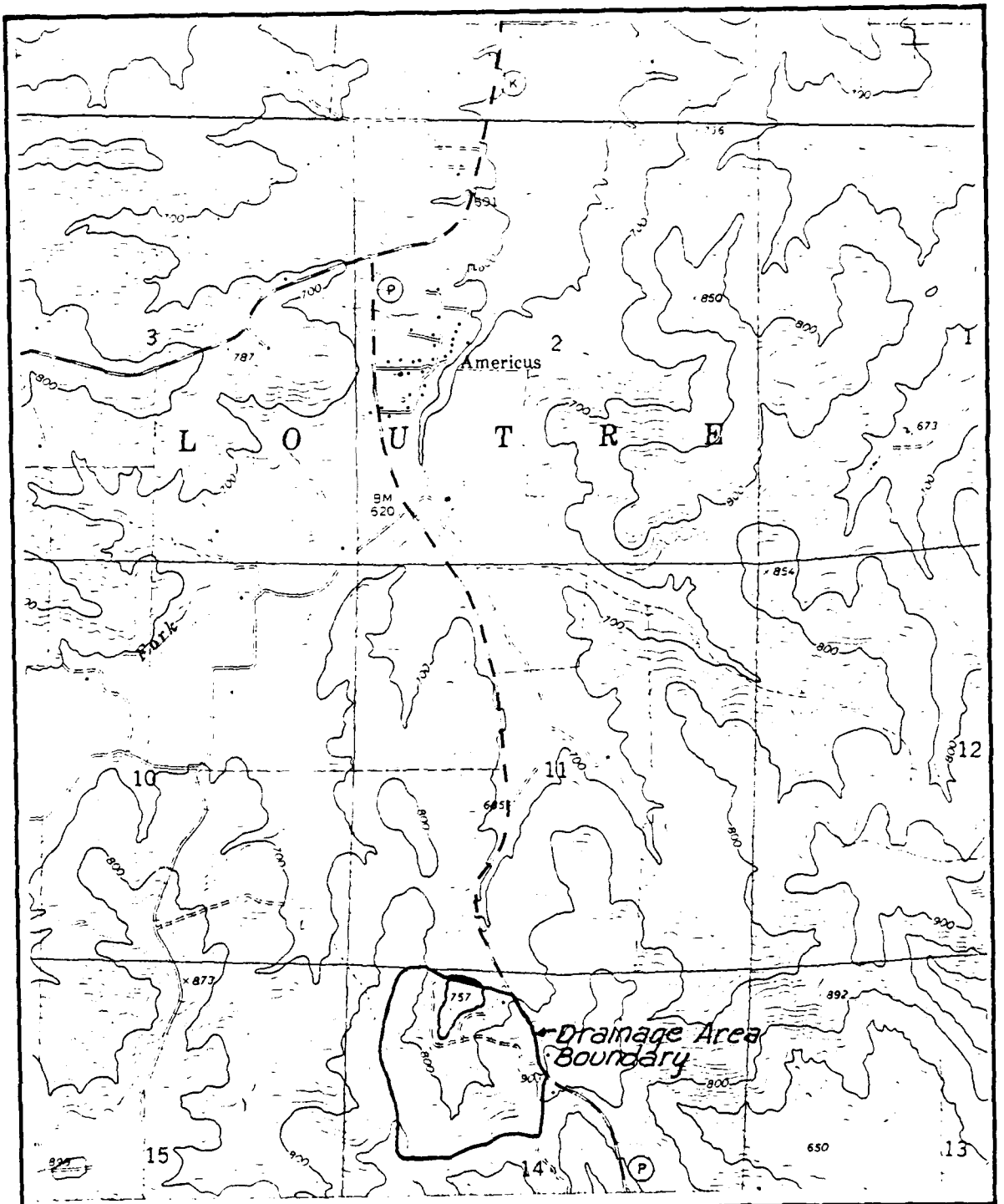
(1) The trees and brush growing on the embankment slopes and in the principal spillway outlet channel should be removed and measures taken to prevent recurrent growth.

(2) The principal spillway should have some sort of trash rack to insure efficient operation.

(3) Potholes on the crest should be filled and surface drainage provided for the crest.

(4) A program of regular inspection and maintenance should be initiated to control tree growth on the dam and to evaluate the condition of the principal spillway riser and conduit.

APPENDIX A
MAPS



Scale in feet

2000 1000 0 2000 4000

Contour Interval - 20'

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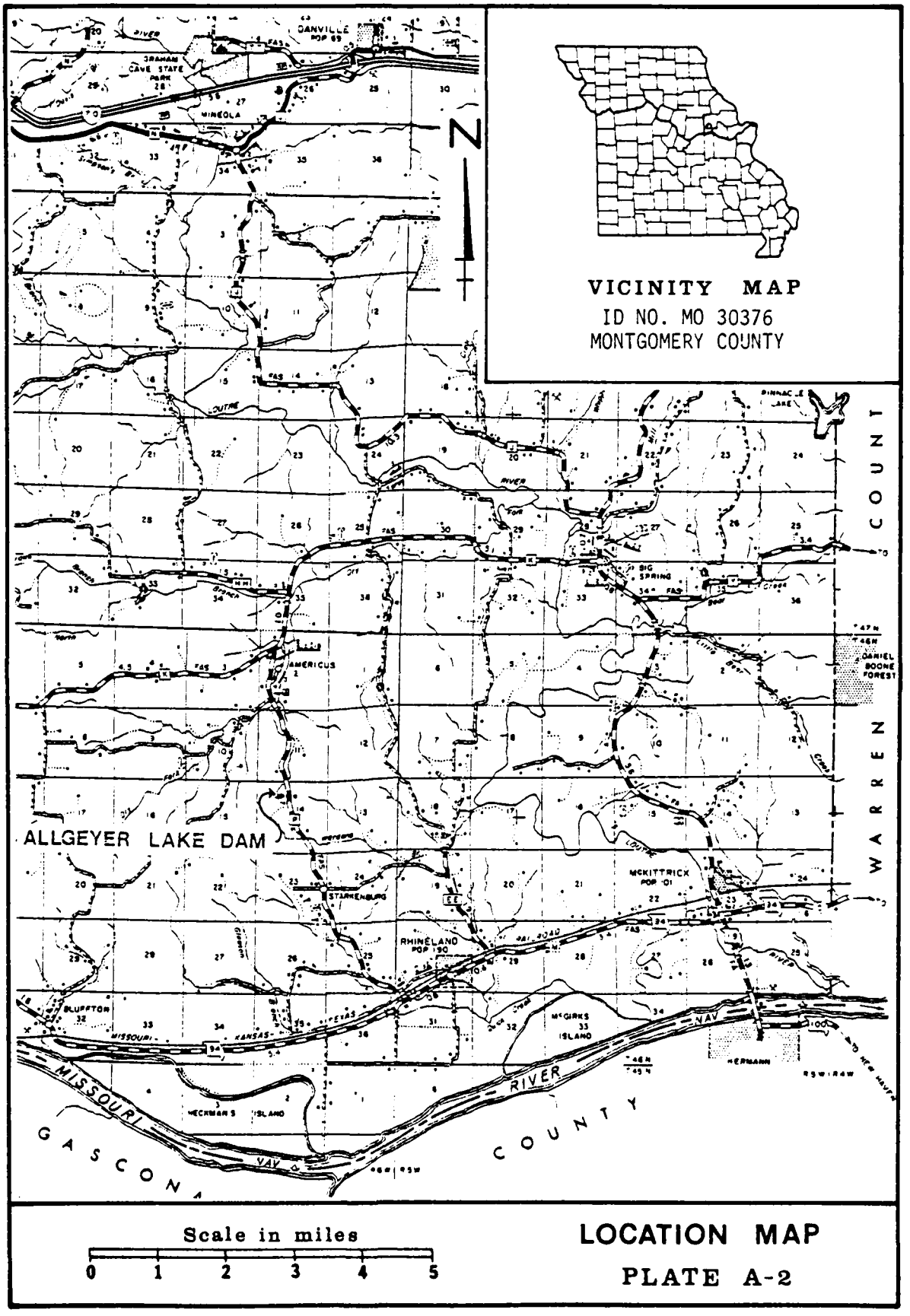
VICINITY TOPOGRAPHY

ALLGEYER LAKE DAM

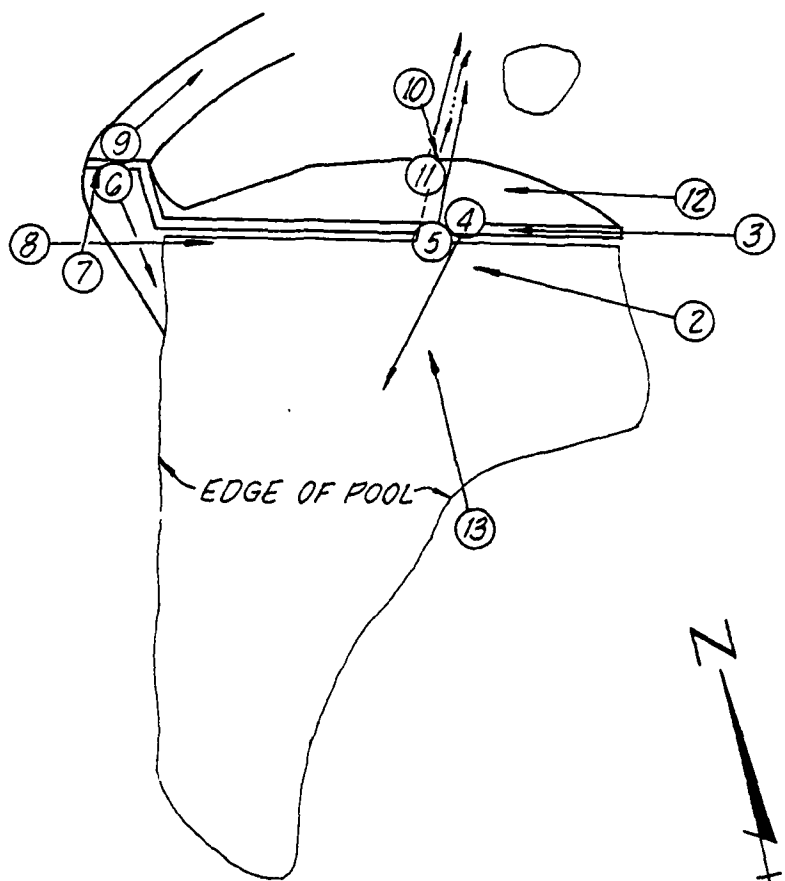
MONTGOMERY COUNTY, M

MO. 30376

PLATE A-1


VICINITY MAP
ID NO. MO 30376
MONTGOMERY COUNTY
ALLGEYER LAKE DAM
DANVILLE
POP 69
WINFIELD
POP 101
RHINELAND
POP 150
McKITTRICK
POP 101
STARKENBURG
AMERICUS
BIG SPRING
PINNACLE LAKE
DANIEL BOONE FOREST
BLUFFTON
McGIRKS ISLAND
HERMANN
MISSOURI RIVER
GASCONADE COUNTY
WARREN COUNTY
Scale in miles
0 1 2 3 4 5
LOCATION MAP
PLATE A-2

APPENDIX B
PHOTOGRAPHS



Scale : 1"=200'

PHOTO INDEX

ALLGEYER LAKE DAM

MONTGOMERY COUNTY, MISSOURI

MO. 30376

PLATE B-1

PHOTO NO. 2 - UPSTREAM SLOPE TAKEN FROM RIGHT SIDE.

PHOTO NO. 3 - CREST TAKEN FROM RIGHT SIDE

PHOTO NO. 4 - PRINCIPAL SPILLWAY RISER

PHOTO NO. 5 - DOWNSTREAM FROM STA. 3+50

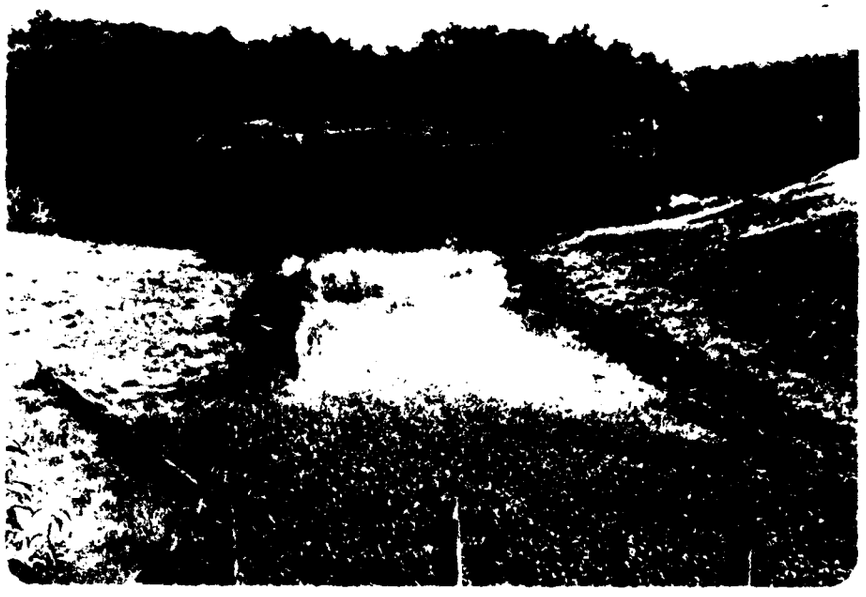


PHOTO NO. 6 - VIEW UPSTREAM IN EMERGENCY SPILLWAY

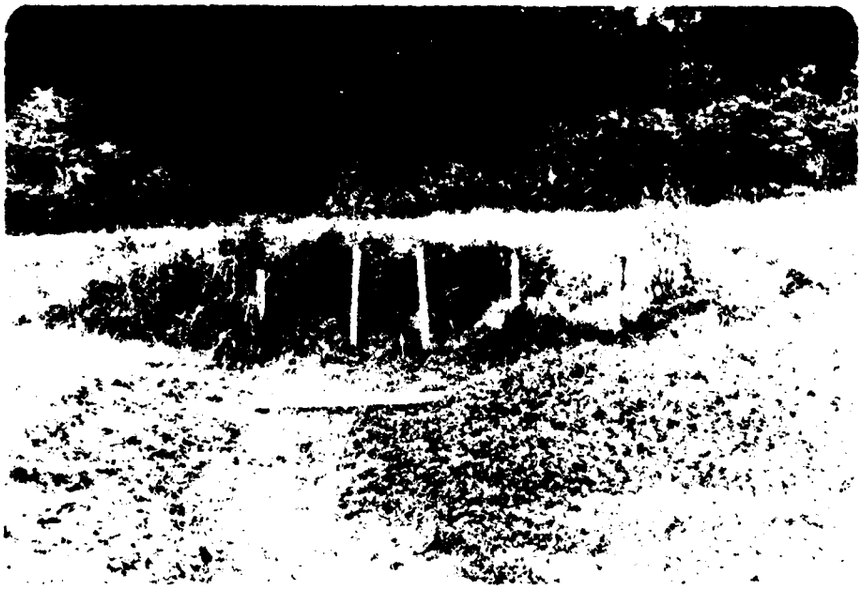


PHOTO NO. 7 - VIEW DOWNSTREAM IN EMERGENCY SPILLWAY SHOWING ROAD SPANNING SPILLWAY

PHOTO NO. 8 - CREST LOOKING ACROSS EMERGENCY SPILLWAY

PHOTO NO. 9 - VIEW DOWNSTREAM IN EMERGENCY SPILLWAY

PHOTO NO. 10 - DOWNSTREAM END OF PRINCIPAL SPILLWAY

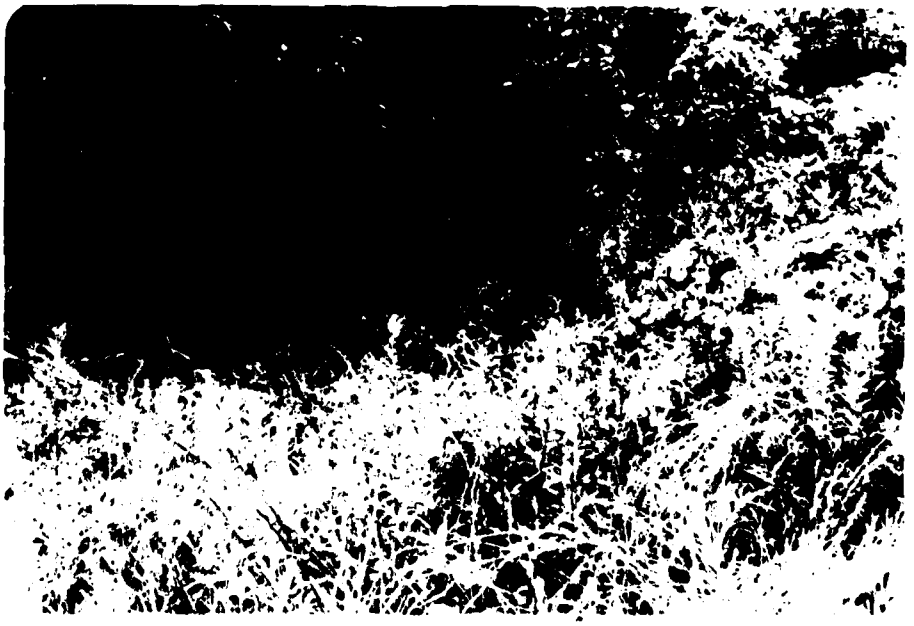
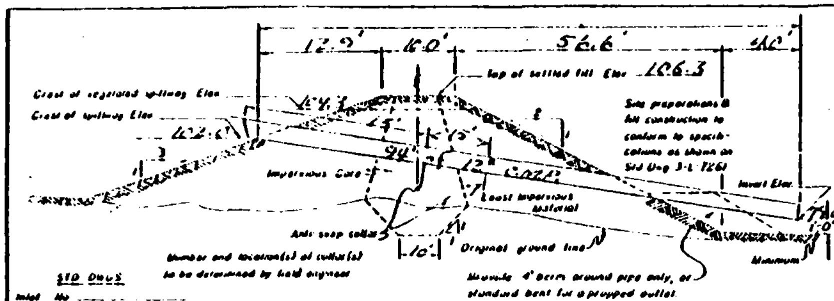


PHOTO NO. 11 - DOWNSTREAM CHANNEL FROM PRINCIPAL SPILLWAY

PHOTO NO. 12 - DOWNSTREAM SLOPE TAKEN FROM RIGHT END

PHOTO NO. 13 - OVERVIEW TAKEN FROM UPSTREAM ON RIGHT SIDE

APPENDIX C
PLAN, PROFILES & SECTION



SECTION SHOWING MECHANICAL SPILLWAY

LAYOUT PLAN

Pool Area at 102.0 --- 4.1 acres

See Original Plan

Show contours required for design mechanical spillway(s) earth fill bench mark & physical features

Emergency Spillway width 30'

See Original Plan

CROSS-SECTION ALONG CENTERLINE OF FILL

(show soil borings)

WATERSHED MAP

See Original Plan

Notes by Decker 8/7/79
Measurements taken on original B.M. 6/22/79
Original B.M. = elev. 100' = MSL = 753.3'
using USGS Quad. elevation of 757' for reservoir elevation

Revised to increase fill yardage to approx. 16,000 cu.yd. at request of landowner.

SCALE 1 INCH = ____ FT.

DESIGN DATA

DRAINAGE AREA 107 ACS
≥ W·(R) ____ +(S.I) ____ +(VC) ____ +(S.S) ____
Q_1 = (P) ____ x(R) ____ x(F) ____ = ____ C.F.S.
SURFACE AREA PERM. POOL = ____ ACS.
6 HOUR RAINFALL = ____ IN. RUNOFF CURVE ____
DESIGN RUNOFF = ____ IN.
VOL. FLOOD RUNOFF (Vf) = ____/12 x ____ (DA) = ____ AC. FT.

PIPE FLOW

$Q_0 = A\sqrt{\frac{2gH}{1+K_e+K_pL}} = (\quad) 8.02\sqrt{\frac{H}{1+(\quad)+(\quad)}} = $ ____ C.F.S.
H (TO EMER. SPILLWAY) = ____ FT.
Q_0/Q_1 = ____ K = ____ (FROM 3-L-45245)
MAXIMUM STAGE ____ FT.
VOL. FLOOD STORAGE REQ'D. (Vs) = K x Vf = ____ x ____ = ____ AC. FT.

HOOD INLET

STAGE-INLET INVERT TO EMERG. SPILLWAY = ____ FT.

EMERGENCY SPILLWAY ($Q = 2.75\,LH^{3/2}$)
DESIGN Q = ____ % OF Q ____ = ____ C.F.S.
WIDTH (L) = ____ FT. DEPTH OF FLOW (H) = ____ FT.
FREEBOARD REQUIRED = ____ FT.

ESTIMATED QUANTITIES

QUAN	UNIT	ITEM
24	FT	Corrugated Metal PIPE, Hayes Bulcock
1	ea.	18" Anti-vortex
2	ea.	5'x5' Anti-seeps
15,204	CY	EARTHFILL settled yardage
600	C.Y.	APPROX. CORE YARDAGE

NOTE: Rivets in longitudinal seams of C.M. Pipe under watertight coupling band shall be flat head or omitted and seams welded inside and outside with a continuous 1/8" fillet weld

COOPERATOR Allgeyer Bros.
COOPERATING WITH Montgomery COUNTY SCD
STATE Missouri SEC 14 T46N R6W
SURVEYED ____ DATE ____

HOOD INLET PIPE SPILLWAY

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Haynes 6-63 — Elton E. Jay, Area Engineer
Revised Blakely 12-22-68

PLATE C-1

U.S. Department of Agriculture
Soil Conservation Service

SCD Montgomery — Date 1-11-66

Work Unit

Farmer-Group Allegyer Texas

Location

Job Slope stakes

Design Sur. — Const. Layout ✓

Const. Check — Other

Dist. Agr. No. — Field No.

ACP No.

SCS-28 (3-60)

PLATE C-2

Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.	
TBM 1	6.9	106.9			100.00
			0.6	106.5	unsuitable fill elev.
3+00			7.3	F-6.2	106.6
1+50			13.0	F-22.4	107.4

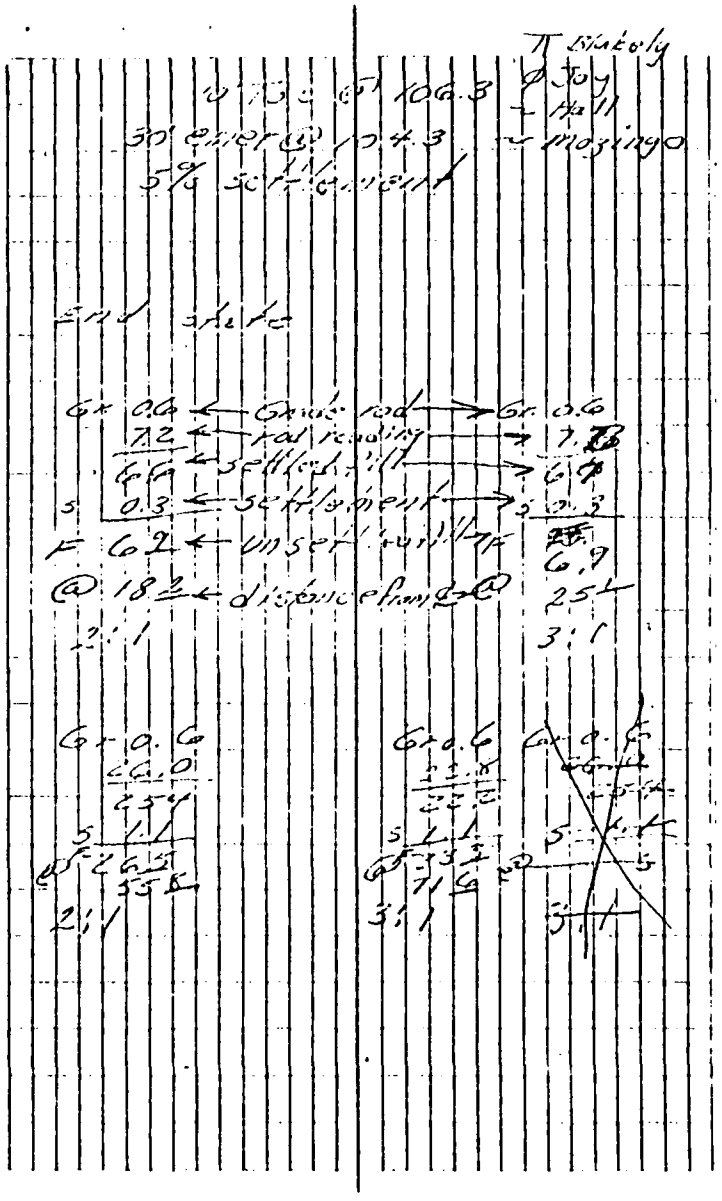
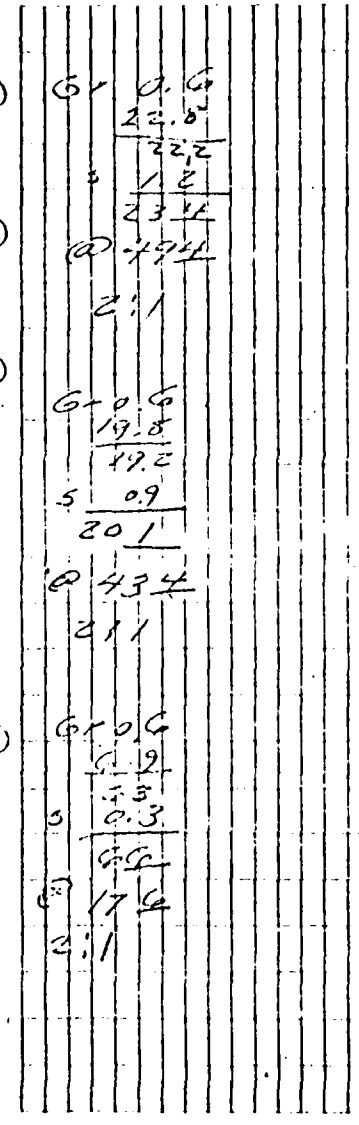
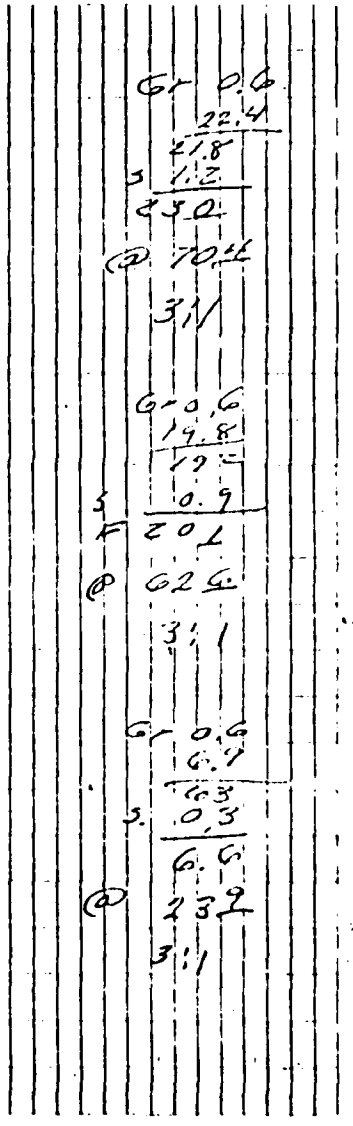


PLATE C-3

GPO 1960 OP 550815

Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.
		1069		
2+50			24.2 F 23.6	107.5
3+50			19.4 F 16.8	107.2
4+50			6.6 F 6.0	106.6



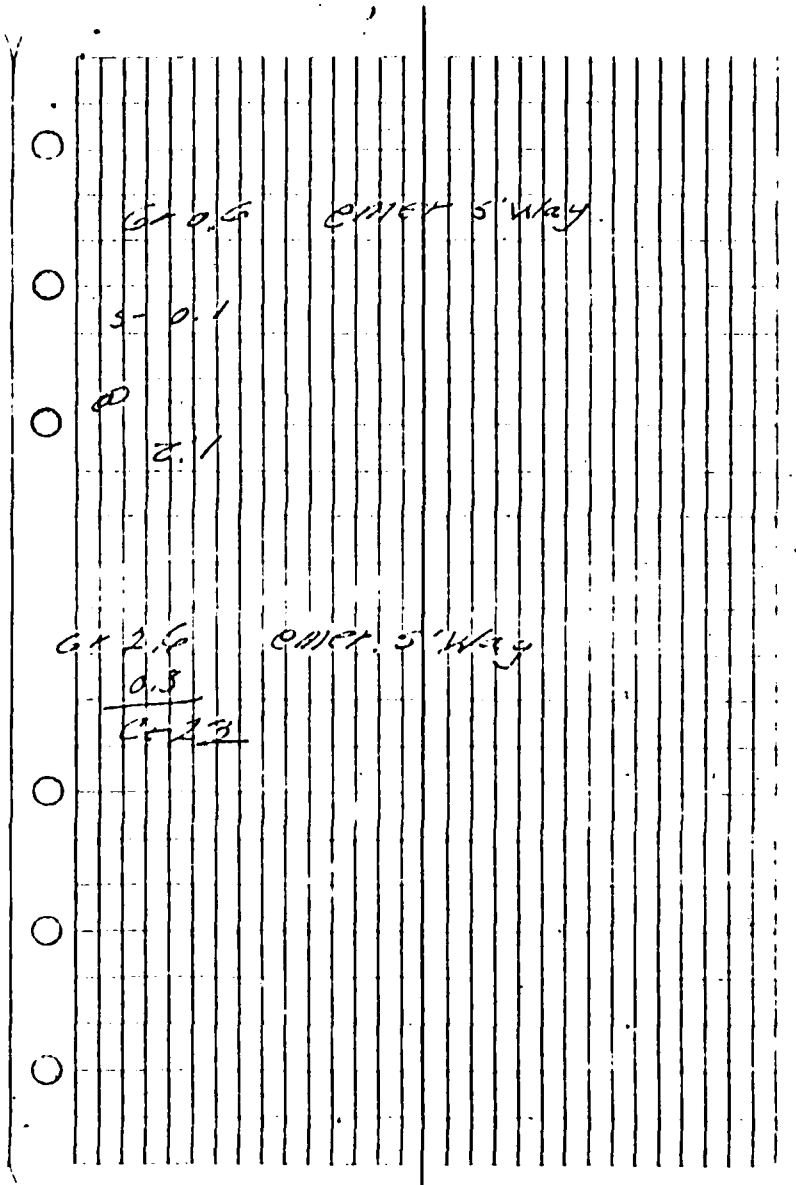


SCS-29 (3-60)

GPO 1960 OF—550816

PLATE C-4

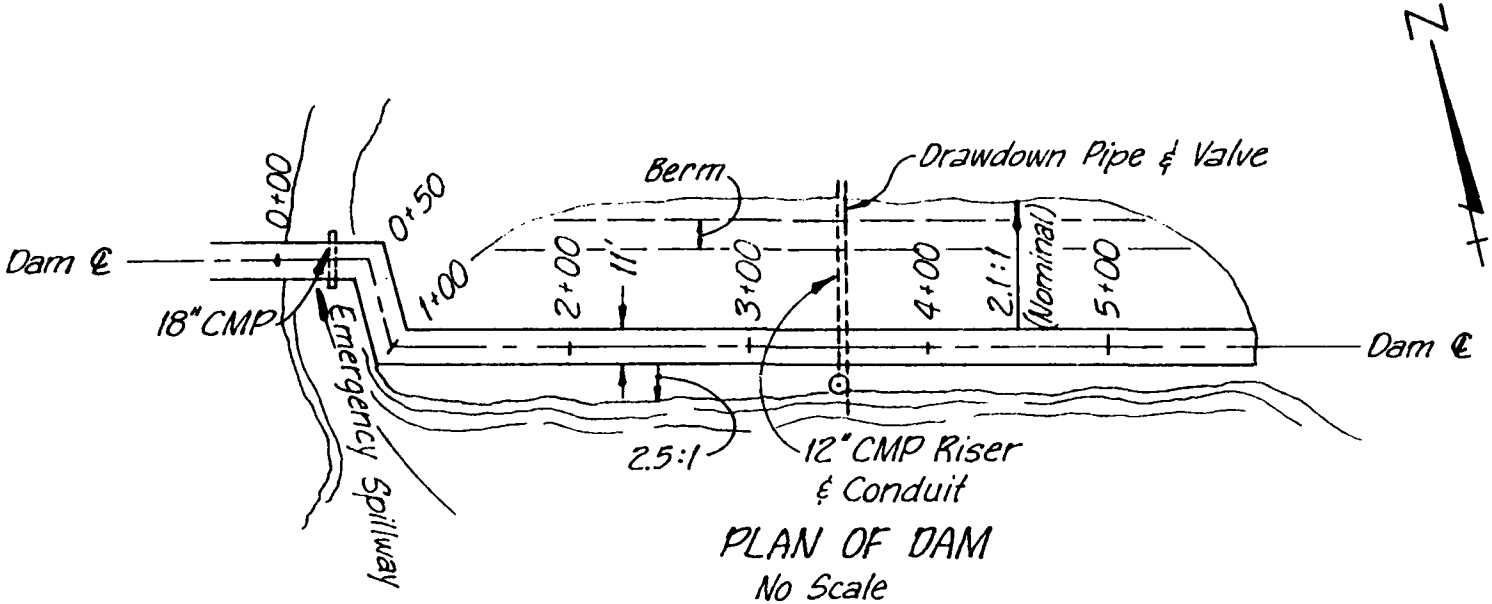
Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.	
		106.9			
84 4+25			2.6	F=2.0	C-0.6
5+14					



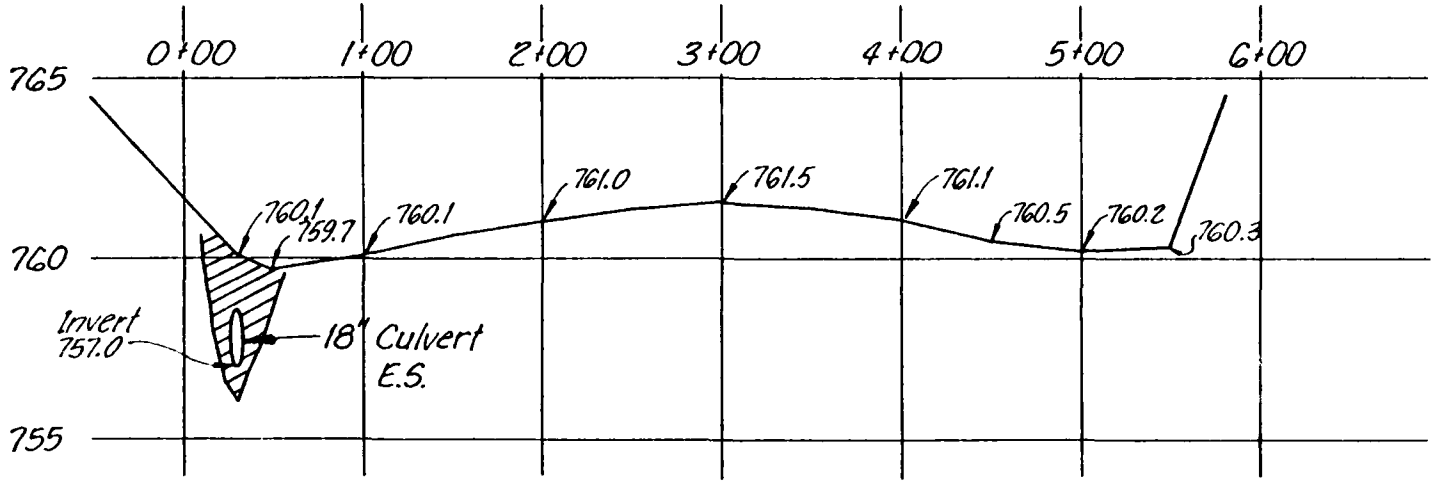
SCS-29 (3-60)

GPO 1960 OF -550816

PLATE C-5

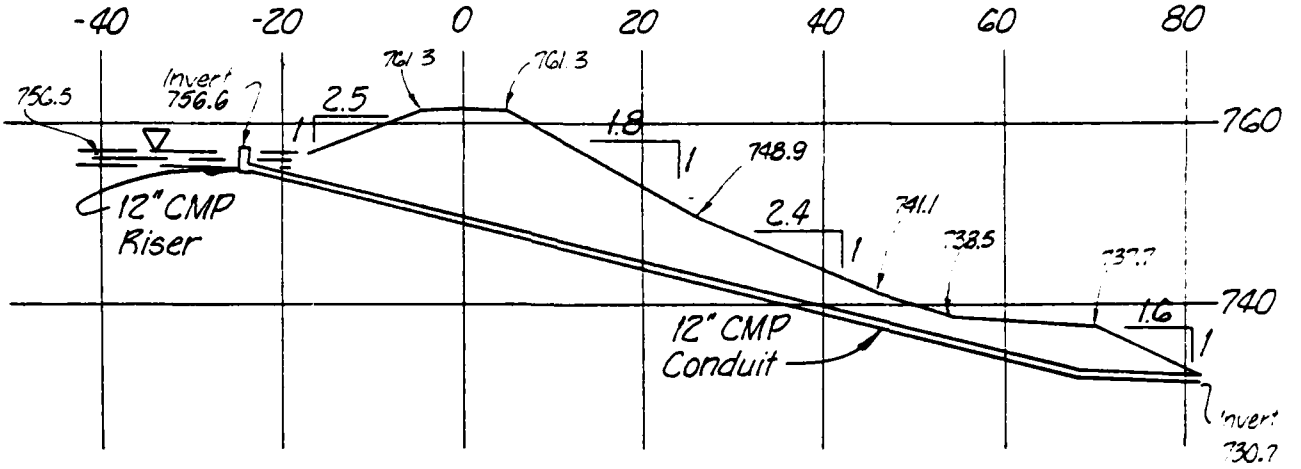


PLAN OF DAM
No Scale

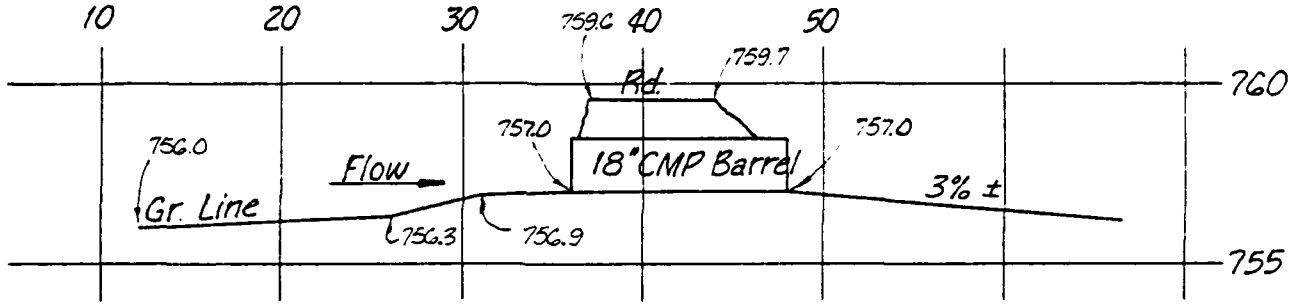


PROFILE ALONG CENTERLINE OF DAM
Scale : 1" = 100' H
1" = 5' V

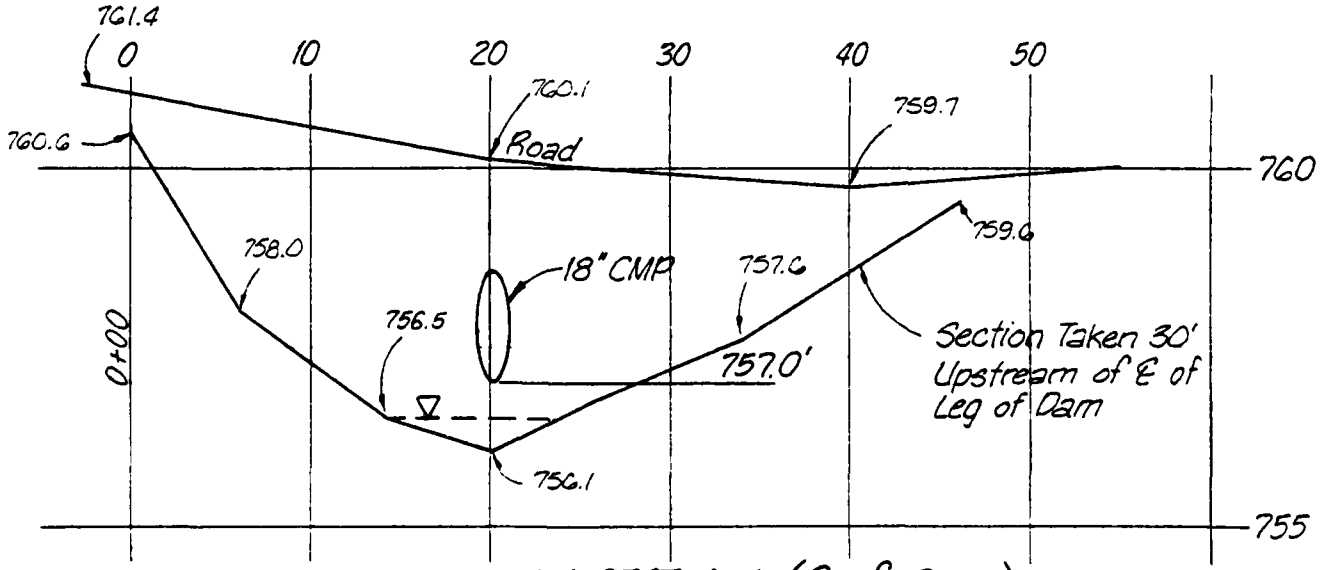
PLATE C-6



DAM SECTION AT STA. 3+50
Scale: 1" = 20'



℄ PROFILE OF SPILLWAY
Scale: 1" = 10' H.
1" = 5 V.



SPILLWAY SECTION (℄ of Dam)
Scale: 1" = 10' H.
1" = 2.5 V.

PLATE C-7

APPENDIX D
HYDROLOGIC COMPUTATIONS

HYDROLOGIC COMPUTATIONS

1. The SCS dimensionless unit hydrograph and the systemized computer program HEC-1 (Dam Safety Version), July 1978, prepared by the Hydrologic Engineering Center, U.S. Corps of Engineers, Davis, California, were used to develop the inflow hydrographs.

   a. Twenty-four hour, 100-year rainfall for the dam location was taken from the data for the rainfall station at Sullivan, MO as supplied by the St. Louis District, Corps of Engineers per their letter dated 6 March 1979. The twenty-four hour probable maximum precipitation was taken from the curves of Hydrometeorological Report No. 33 and current Corps of Engineers and St. Louis District policy and guidance for hydraulics and hydrology.

   b. Drainage area = 0.15 square miles (96.9 acres).

   c. Time of concentration of runoff = 11 minutes (computed from "Kirpich" formula).

   d. The antecedent storm conditions for the probable maximum precipitation were heavy rainfall and low temperatures which occurred on the previous 5 days (SCS AMC III). The antecedent storm conditions for the 100-year precipitation were an average of the conditions which have preceded the occurrence of the maximum annual flood on numerous watersheds (SCS AMC II). The initial pool elevation was assumed at the crest of the notch in the CMP riser.

   e. The total twenty-four hour storm duration losses for the 100-year storm were 3.42 inches. The total losses for the PMF storm were 2.03 inches. These data are based on SCS runoff curve No. 85 and No. 70 for antecedent moisture conditions SCS AMC III and AMC II, respectively. The watershed is composed of primarily SCS soil group C (Hatton-Keswick-Goss-Gasconade soils) and consists mostly of woodland with some alfalfa and grass.

   f. Average soil loss rates = 0.10 inch per hour approximately.

2. The discharge ratings for the principal spillway were developed using equations for orifice, weir, and full conduit flow. They are as follows:

a. Orifice flow equation ($Q = CA\sqrt{2gH}$)
where C = orifice coefficient = 0.6
A = area of opening, $ft.^2$ = 0.785
H = total head, ft.

b. Weir flow equation ($Qw = CLH^{3/2}$)
where C = weir coefficient = 3.5
L = length of weir, ft. = 3.14
H = total head, ft.

c. Full conduit flow equation $\left(Q = a\sqrt{\frac{2gH}{1 + K_e + K_b + K_pL}}\right)$

where a = cross-sectional area of pipe, ft^2 = 0.785
H = total head, ft.
K_e = coefficient for entrance loss = 0.5
K_b = coefficient for bend loss = 0.75
K_p = coefficient for pipe friction loss = 0.1157
L = length of pipe, ft. = 107

The emergency spillway rating was developed using nomograph for C.M. Pipe culverts with inlet control from the BPR Manual on Highway Culverts, Jan. 1963.

The flows over the dam crest were developed using HEC-1 (Dam Safety Version) program with a discharge coefficient of 2.9 and a value of 1.5 for the exponent of head.

3. Floods were routed through the reservoir using the HEC-1 (Dam Safety Version) program to determine the capabilities of the spillway and dam embankment crest. The output and plotted hydrographs are shown in this Appendix.

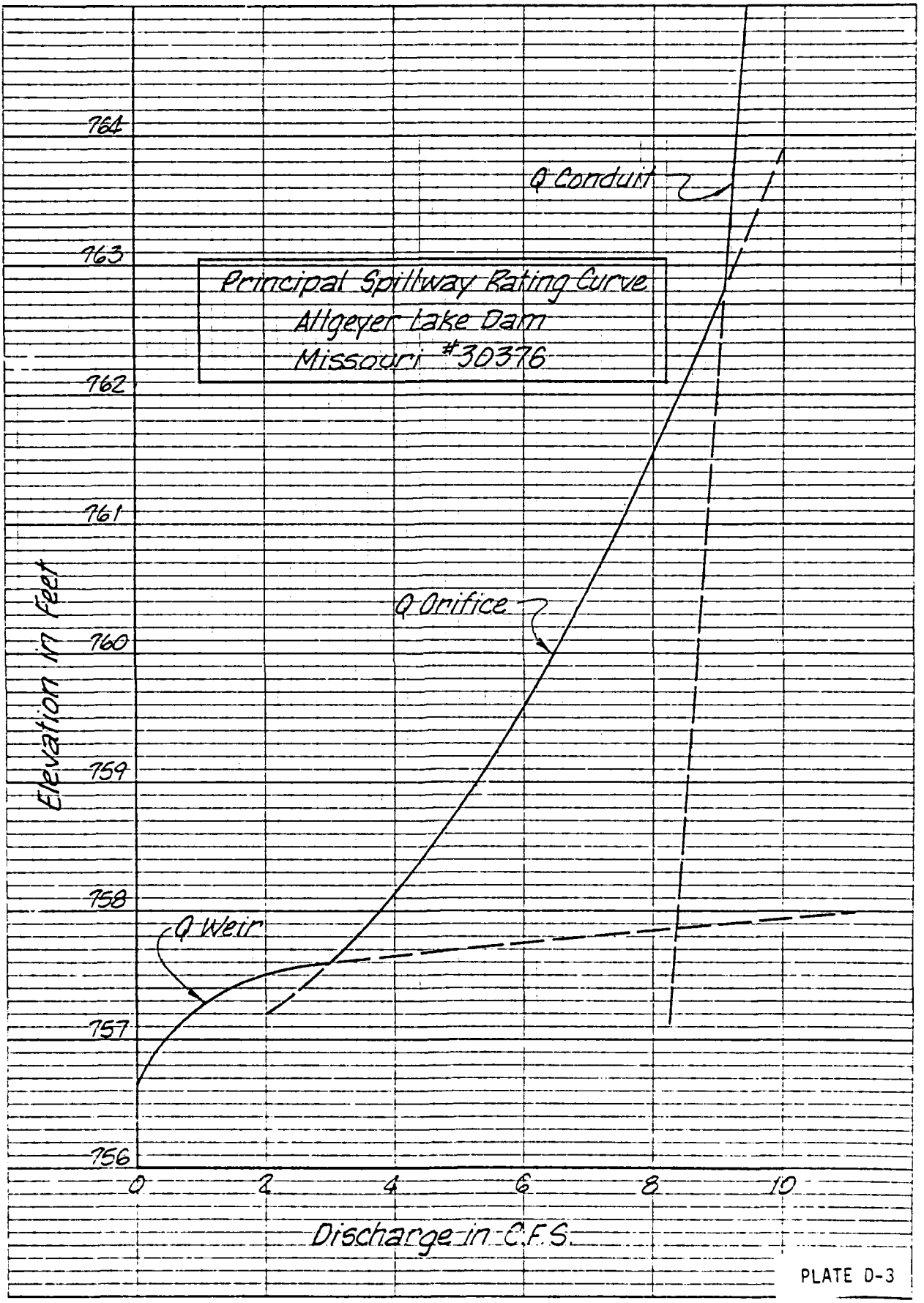

Principal Spillway Rating Curve
Allgeyer Lake Dam
Missouri #30376
Q Conduit
Q Orifice
Q Weir
Elevation in Feet
764
763
762
761
760
759
758
757
756
0
2
4
6
8
10
Discharge in C.F.S.

PLATE D-3

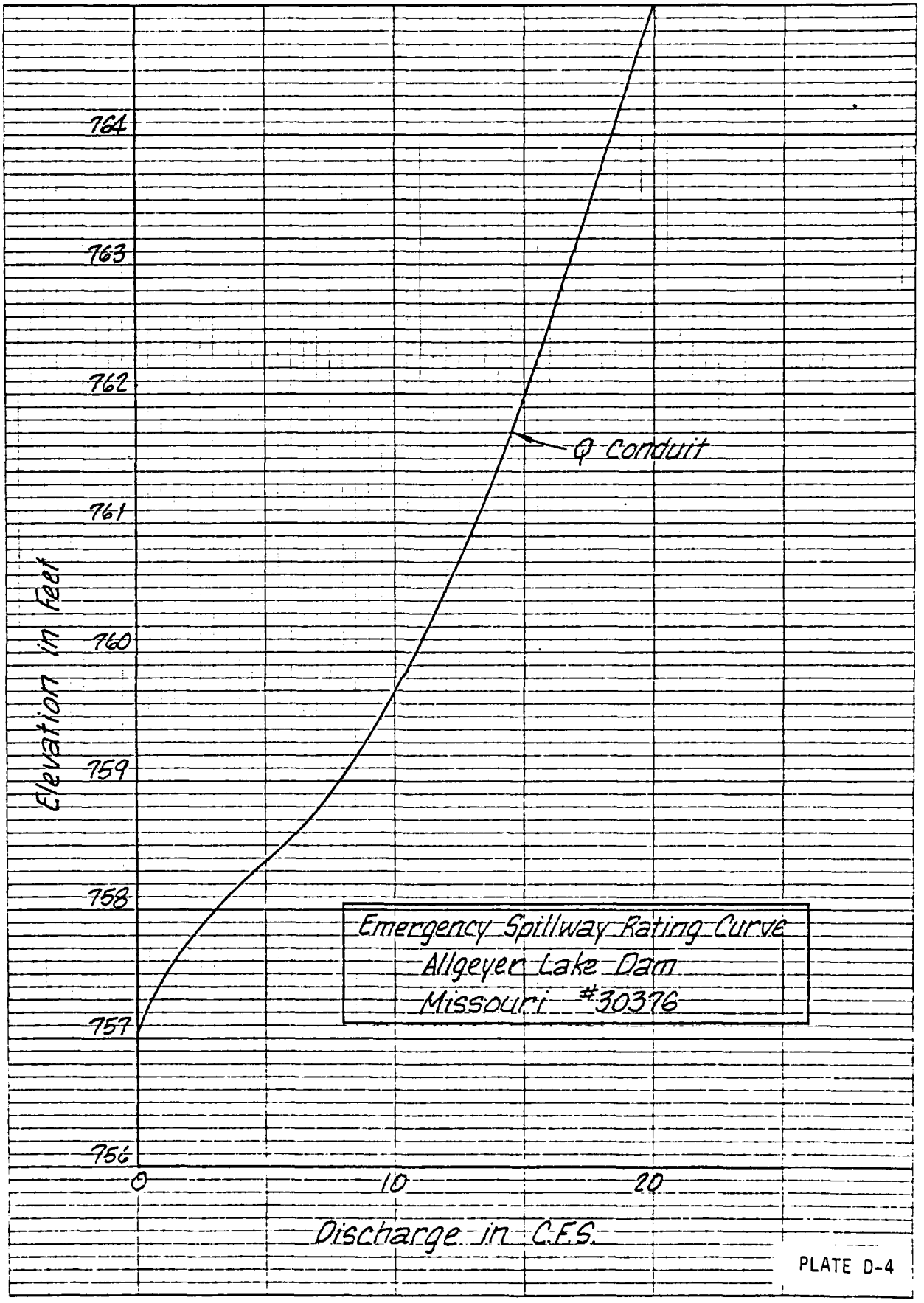

764
763
762
761
760
759
758
757
756
Elevation in feet
Q conduit
0
10
20
Discharge in C.F.S.
Emergency Spillway Rating Curve
Allgeyer Lake Dam
Missouri #30376

PLATE D-4

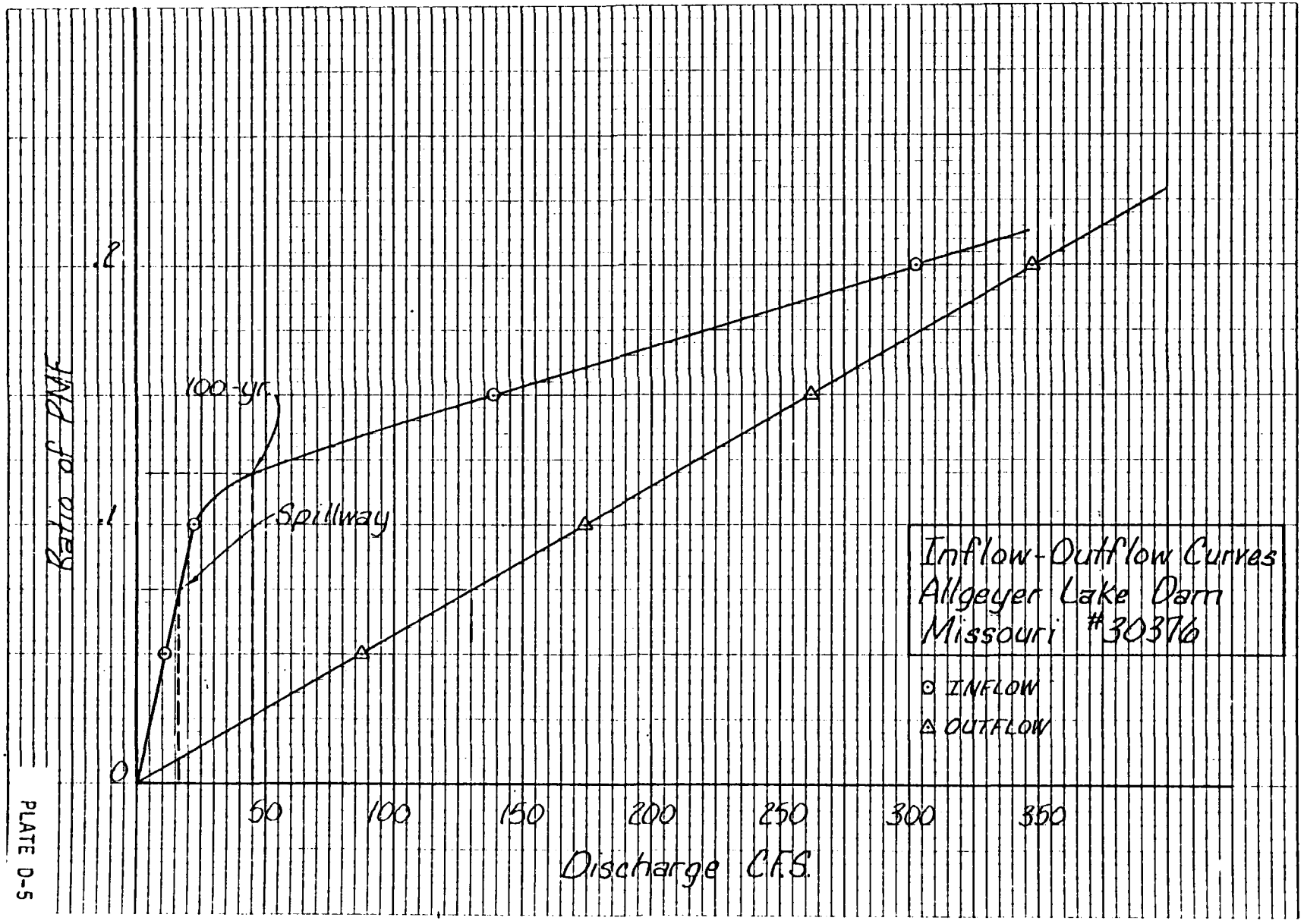


PLATE D-5

```
A1       ANALYSIS OF DAM OVERTOPPING USING RATIOS OF [illegible]
A2       HYDROLOGIC-HYDRAULIC ANALYSIS OF SAFETY OF ALLGEYER LAKE DAM 30376
A3       RATIOS OF PMF ROUTED THROUGH THE RESERVOIR
B 000200COCCOCC000000005                         C000000000C000C0C0000003
B1C0C0C5
J C00001CCCCUCC90CC000C1
J1C00.05CCCC0.100000.150000C.2000000.3500000.5000000.6500000.80C00001.0
K CCCCCCC0C00001                 00000600000000000C0000001
K1       CALCULATION OF INFLO HYDRG TO RES 30376
M C00001C0C0CCC20C00.151         0000.151000001.0                    00000001
P COCCCCC0025.000000102C0000121000000130
T                                                       -1.0    -85.0
W2       C0000.17
X C00000     -.010CCG0001
K COC0C1CCC00002                 C0C000020C00000CC0000001
K1       ROUTED FLOWS THRU RES 30376
Y                             G0000C0100000001
Y1C00001                                              -756.6       -1
Y40756.6C00756.8000757.C000757.3000757.5000757.6000758.0000759.0C00760.0000761.0
Y40762.000C762.5000762.8000762.9000763.0000764.0000765.0
Y5CCCCCCCCC0CC.2C0CGC0.4C000C1.6CCC003.1000004.4C00006.9000013.3000017.3000020.7
Y50023.4000024.9000025.5000025.8000025.9C00027.7000C29.4
$SCC00CCCCC00005UC0000100000C160000022000000300000039000000450000059000001I9
$F0756.6C0C758.000C759.C000760.0000761.0000762.0000763.0000764.0000765.0000770.0
$10756.6
$0C759.7CCCC02.50CC001.500000630
$10C007CC0CC0165000C022CC0000340000004300000055500000560000005930000630
$V0760.1000760.3000760.5000761.0000761.3000761.5000762.0000763.0000764.5
K 0CC0SS
A
A
A
A
A
```

```
**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  26 FEB 79
**********

RUN  DATE  79/08/04.
     TIME  11.40.25.
```

ANALYSIS OF DAM OVERTOPPING USING RATIOS OF PMF
HYDROLOGIC-HYDRAULIC ANALYSIS OF SAFETY OF ALLEGEYER LAKE DAM 30376
RATIOS OF PMF ROUTED THROUGH THE RESERVOIR

JOB SPECIFICATION

NQ	NHR	NPLN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
288	0	5	C	0	0	0	0	3	0

JOPER	NWT	LROPT	TRACE
5	0	0	0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 9 LRTIO= 1

RTIOS= .05 .10 .15 .20 .35 .50 .65 .80 1.00

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

CALCULATION OF INFLO HYDRO TO RES 30376

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
000001	0	0	C	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	2	.15	0.00	.15	1.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	25.00	102.00	121.00	130.00	0.00	0.00	0.00

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	-1.00	-85.00	0.00	0.00

CURVE NO = -85.00 WETNESS = -1.00 EFFECT CN = 85.00

UNIT HYDROGRAPH DATA
TC= 0.00 LAG= .17

RECESSION DATA
STRTQ= 0.00 QRCSN= -.01 RTIOR= 1.00

UNIT HYDROGRAPH 12 END OF PERIOD ORDINATES, TC= 0.00 HOURS, LAG= .17 VOL= 1.00

105. 317. 124. 204. 102. 55. 29. 15. 8. 4.
2. 1.

END-OF-PERIOD FLOW

1.01	10.15	123	.07	.06	.01	69.	1.01	22.15	267	.02	.02	.00	22.
1.01	10.20	124	.07	.06	.01	69.	1.01	22.20	268	.02	.02	.00	22.
1.01	10.25	125	.07	.06	.01	70.	1.01	22.25	269	.02	.02	.00	22.
1.01	10.30	126	.07	.06	.01	70.	1.01	22.30	270	.02	.02	.00	22.
1.01	10.35	127	.07	.06	.01	70.	1.01	22.35	271	.02	.02	.00	22.
1.01	10.40	128	.07	.06	.01	70.	1.01	22.40	272	.02	.02	.00	22.
1.01	10.45	129	.07	.06	.01	70.	1.01	22.45	273	.02	.02	.00	22.
1.01	10.50	130	.07	.06	.01	70.	1.01	22.50	274	.02	.02	.00	22.
1.01	10.55	131	.07	.06	.01	70.	1.01	22.55	275	.02	.02	.00	22.
1.01	11.00	132	.07	.06	.01	71.	1.01	23.00	276	.02	.02	.00	22.
1.01	11.05	133	.07	.06	.01	71.	1.01	23.05	277	.02	.02	.00	22.
1.01	11.10	134	.07	.06	.01	71.	1.01	23.10	278	.02	.02	.00	22.
1.01	11.15	135	.07	.06	.00	71.	1.01	23.15	279	.02	.02	.00	22.
1.01	11.20	136	.07	.06	.00	71.	1.01	23.20	280	.02	.02	.00	22.
1.01	11.25	137	.07	.06	.00	71.	1.01	23.25	281	.02	.02	.00	22.
1.01	11.30	138	.07	.06	.00	71.	1.01	23.30	282	.02	.02	.00	22.
1.01	11.35	139	.07	.06	.00	71.	1.01	23.35	283	.02	.02	.00	22.
1.01	11.40	140	.07	.06	.00	72.	1.01	23.40	284	.02	.02	.00	22.
1.01	11.45	141	.07	.06	.00	72.	1.01	23.45	285	.02	.02	.00	22.
1.01	11.50	142	.07	.06	.00	72.	1.01	23.50	286	.02	.02	.00	22.
1.01	11.55	143	.07	.06	.00	72.	1.01	23.55	287	.02	.02	.00	22.
1.01	12.00	144	.07	.06	.00	72.	1.02	0.00	288	.02	.02	.00	22.
								SUM		32.50	30.47	2.03	35576.
										(825.)(	774.)(	51.)(	1007.40)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1740.	405.	123.	123.	35555.
CMS	49.	11.	3.	3.	1007.
INCHES		24.92	30.42	30.42	30.42
MM		633.05	772.72	772.72	772.72
AC-FT		201.	245.	245.	245.
THOUS CU M		247.	302.	302.	302.

HYDROGRAPH AT STA000001 FOR PLAN 1, RTIO 1

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	87.	20.	6.	6.	1778.
CMS	2.	1.	0.	0.	50.
INCHES		1.25	1.52	1.52	1.52
MM		31.65	38.64	38.64	38.64
AC-FT		10.	12.	12.	12.
THOUS CU M		12.	15.	15.	15.

HYDROGRAPH AT STA000001 FOR PLAN 1, RTIO 2

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	174.	40.	12.	12.	3556.
CMS	5.	1.	0.	0.	101.
INCHES		2.49	3.04	3.04	3.04
MM		63.31	77.27	77.27	77.27
AC-FT		20.	24.	24.	24.
THOUS CU M		25.	30.	30.	30.

HYDROGRAPH AT STA000001 FOR PLAN 1, RTIO 3

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	261.	61.	19.	19.	5333.
CMS	7.	2.	1.	1.	151.
INCHES		3.74	4.56	4.56	4.56
MM		94.96	115.91	115.91	115.91
AC-FT		30.	37.	37.	37.
THOUS CU M		37.	45.	45.	45.

HYDROGRAPH AT STA0000001 FOR PLAN 1, RTIO 4

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	348.	81.	25.	25.	7111.
CMS	10.	2.	1.	1.	201.
INCHES		4.98	6.08	6.08	6.08
MM		126.61	154.54	154.54	154.54
AC-FT		40.	49.	49.	49.
THOUS CU M		49.	60.	60.	60.

HYDROGRAPH AT STA0000001 FOR PLAN 1, RTIO 5

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	609.	142.	43.	43.	12444.
CMS	17.	4.	1.	1.	352.
INCHES		8.72	10.65	10.65	10.65
MM		221.57	270.45	270.45	270.45
AC-FT		70.	86.	86.	86.
THOUS CU M		87.	106.	106.	106.

HYDROGRAPH AT STA0000001 FOR PLAN 1, RTIO 6 0.5 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	870.	202.	62.	62.	17778.
CMS	25.	6.	2.	2.	503.
INCHES		12.46	15.21	15.21	15.21
MM		316.53	386.36	386.36	386.36
AC-FT		100.	122.	122.	122.
THOUS CU M		124.	151.	151.	151.

HYDROGRAPH AT STA0000001 FOR PLAN 1, RTIO 7

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1131.	263.	80.	80.	23111.
CMS	32.	7.	2.	2.	654.
INCHES		16.20	19.77	19.77	19.77
MM		411.48	502.27	502.27	502.27
AC-FT		130.	159.	159.	159.
THOUS CU M		161.	196.	196.	196.

HYDROGRAPH AT STA0000001 FOR PLAN 1, RTIO 8

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1392.	324.	99.	99.	29444.

CMS	39.	9.	3.	3.	805.
INCHES		19.94	24.34	24.34	24.34
MM		506.44	618.17	618.17	618.17
AC-FT		160.	196.	196.	196.
THOUS CU M		198.	242.	242.	242.

HYDROGRAPH AT STA000001 FOR PLAN 1, RTIO 9 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1740.	405.	123.	123.	35555.
CMS	49.	11.	3.	3.	1007.
INCHES		24.92	30.42	30.42	30.42
MM		633.05	772.72	772.72	772.72
AC-FT		201.	245.	245.	245.
THOUS CU M		247.	302.	302.	302.

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

ROUTED FLOWS THRU RES 30376

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
000002	1	0	0	2	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTOL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-757.	-1

STAGE	756.60	756.80	757.00	757.30	757.50	757.60	758.00	759.00	760.00	761.00
	762.00	762.50	762.80	762.90	763.00	764.00	765.00			
FLOW	0.00	.20	.40	1.60	3.10	4.40	6.90	13.30	17.30	20.70
	23.40	24.90	25.50	25.80	25.90	27.70	29.40			
CAPACITY=	0.	5.	10.	16.	22.	30.	39.	49.	59.	119.
ELEVATION=	757.	758.	759.	760.	761.	762.	763.	764.	765.	770.

CREL	SPWID	CCOM	EXPW	ELEVL	COQL	CAREA	EXPI
756.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQE	EXPD	DAMWID
759.7	2.9	1.5	630.

CREST LENGTH	70.	165.	220.	360.	430.	555.	568.	593.	630.
AFLUX PEAK ELEVATION	760.1	760.3	760.5	761.0	761.3	761.5	762.0	763.0	764.5

STATION 000002, PLAN 1, RATIO 1

STATION 000002, PLAN 1, RATIO 6 [0.5 PMF]

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	1.	1.	1.	1.	1.	2.	2.	2.
3.	3.	4.	4.	5.	5.	5.	6.	6.	6.
6.	7.	7.	7.	7.	8.	8.	8.	8.	8.
9.	9.	9.	9.	10.	10.	10.	10.	10.	11.
11.	11.	11.	11.	12.	12.	12.	12.	12.	13.
13.	13.	13.	13.	13.	14.	14.	14.	14.	14.
14.	14.	14.	14.	14.	15.	15.	15.	16.	16.
17.	17.	17.	22.	40.	62.	83.	99.	113.	123.
131.	136.	139.	142.	143.	144.	145.	145.	146.	150.
156.	164.	171.	175.	178.	180.	182.	183.	183.	183.
182.	178.	175.	184.	210.	268.	413.	647.	812.	792.
661.	525.	402.	323.	268.	232.	209.	195.	186.	181.
177.	176.	174.	174.	173.	169.	162.	155.	149.	144.
141.	139.	138.	137.	137.	137.	134.	123.	102.	79.
62.	49.	41.	35.	30.	27.	25.	23.	22.	21.
20.	19.	19.	18.	18.	18.	18.	18.	18.	18.
18.	18.	17.	17.	17.	17.	17.	17.	17.	17.
17.	17.	17.	17.	17.	17.	17.	17.	17.	17.
17.	17.	17.	17.	17.	17.	17.	17.	17.	17.
17.	17.	17.	17.	17.	17.	17.	17.	17.	17.
17.	16.	16.	16.	16.	16.	16.	16.		

STORAGE

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	1.	1.	1.	1.	1.	1.	1.
1.	1.	2.	2.	2.	2.	2.	2.	3.	3.
3.	3.	3.	4.	4.	4.	4.	4.	4.	5.
5.	5.	5.	5.	5.	6.	6.	6.	6.	6.
6.	7.	7.	7.	7.	7.	7.	8.	8.	8.
8.	8.	8.	9.	9.	9.	9.	9.	9.	9.
10.	10.	10.	10.	10.	10.	11.	11.	11.	11.
11.	11.	11.	12.	12.	12.	12.	13.	14.	14.
15.	16.	16.	17.	18.	18.	18.	19.	19.	19.
19.	19.	19.	19.	19.	19.	19.	19.	19.	19.
19.	19.	19.	19.	20.	20.	20.	20.	20.	20.
20.	20.	20.	20.	20.	20.	21.	23.	24.	24.
23.	22.	21.	21.	20.	20.	20.	20.	20.	20.
20.	20.	19.	19.	19.	19.	19.	19.	19.	19.
19.	19.	19.	19.	19.	19.	19.	19.	19.	18.
18.	18.	18.	17.	17.	17.	17.	17.	17.	17.
17.	17.	17.	17.	17.	17.	17.	17.	16.	16.

16.	16.	16.	16.	16.	16.	16.	16.	16.	16.
16.	16.	16.	16.	16.	16.	16.	16.	16.	16.
16.	16.	15.	15.	15.	15.	15.	15.	15.	15.
15.	15.	15.	15.	15.	15.	15.	15.	15.	15.
15.	15.	15.	15.	15.	15.	15.	15.		

STAGE

756.6	756.6	756.6	756.6	756.6	756.6	756.6	756.6	756.6	756.6
756.6	756.6	756.6	756.6	756.6	756.6	756.6	756.6	756.6	756.6
756.6	756.6	756.6	756.6	756.6	756.6	756.6	756.6	756.6	756.6
756.6	756.6	756.6	756.6	756.6	756.6	756.6	756.6	756.6	756.6
756.6	756.6	756.6	756.6	756.6	756.6	756.6	756.6	756.6	756.6
756.6	756.6	756.6	756.6	756.6	756.7	756.7	756.7	756.7	756.7
756.7	756.7	756.7	756.7	756.7	756.7	756.7	756.7	756.7	756.7
756.7	756.7	756.7	756.7	756.8	756.8	756.8	756.9	756.9	756.9
757.0	757.0	757.1	757.1	757.2	757.2	757.2	757.3	757.3	757.4
757.4	757.5	757.5	757.6	757.6	757.7	757.7	757.8	757.8	757.9
757.9	758.0	758.0	758.0	758.1	758.1	758.1	758.2	758.2	758.2
758.3	758.3	758.3	758.4	758.4	758.4	758.5	758.5	758.5	758.6
758.6	758.6	758.7	758.7	758.7	758.8	758.8	758.8	758.9	758.9
758.9	759.0	759.0	759.0	759.0	759.1	759.1	759.1	759.1	759.2
759.2	759.2	759.2	759.3	759.3	759.3	759.4	759.5	759.6	759.7
759.8	759.9	760.1	760.2	760.3	760.3	760.4	760.4	760.5	760.5
760.5	760.5	760.5	760.5	760.5	760.5	760.5	760.5	760.5	760.5
760.6	760.6	760.6	760.6	760.6	760.6	760.6	760.6	760.6	760.6
760.6	760.6	760.6	760.6	760.6	760.7	760.9	761.1	761.2	761.2
761.1	761.0	760.9	760.8	760.7	760.7	760.6	760.6	760.6	760.6
760.6	760.6	760.6	760.6	760.6	760.6	760.6	760.5	760.5	760.5
760.5	760.5	760.5	760.5	760.5	760.5	760.5	760.5	760.4	760.4
760.3	760.3	760.3	760.2	760.2	760.2	760.2	760.2	760.2	760.2
760.1	760.1	760.1	760.1	760.1	760.1	760.1	760.1	760.1	760.1
760.1	760.1	760.1	760.0	760.0	760.0	760.0	760.0	760.0	760.0
760.0	760.0	760.0	760.0	760.0	760.0	760.0	759.9	759.9	759.9
759.9	759.9	759.9	759.9	759.9	759.9	759.9	759.9	759.9	759.9
759.9	759.9	759.9	759.8	759.8	759.8	759.8	759.8	759.8	759.8
759.8	759.8	759.8	759.8	759.8	759.8	759.8	759.8		

PEAK OUTFLOW IS 812. AT TIME 15.75 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	812.	153.	54.	54.	15689.
CMS	23.	5.	2.	2.	444.
INCHES		11.90	13.42	13.42	13.42
MM		302.15	340.96	340.96	340.96
AC-FT		96.	108.	108.	108.
THOUS CU M		118.	133.	133.	133.

EVE

STATION000002

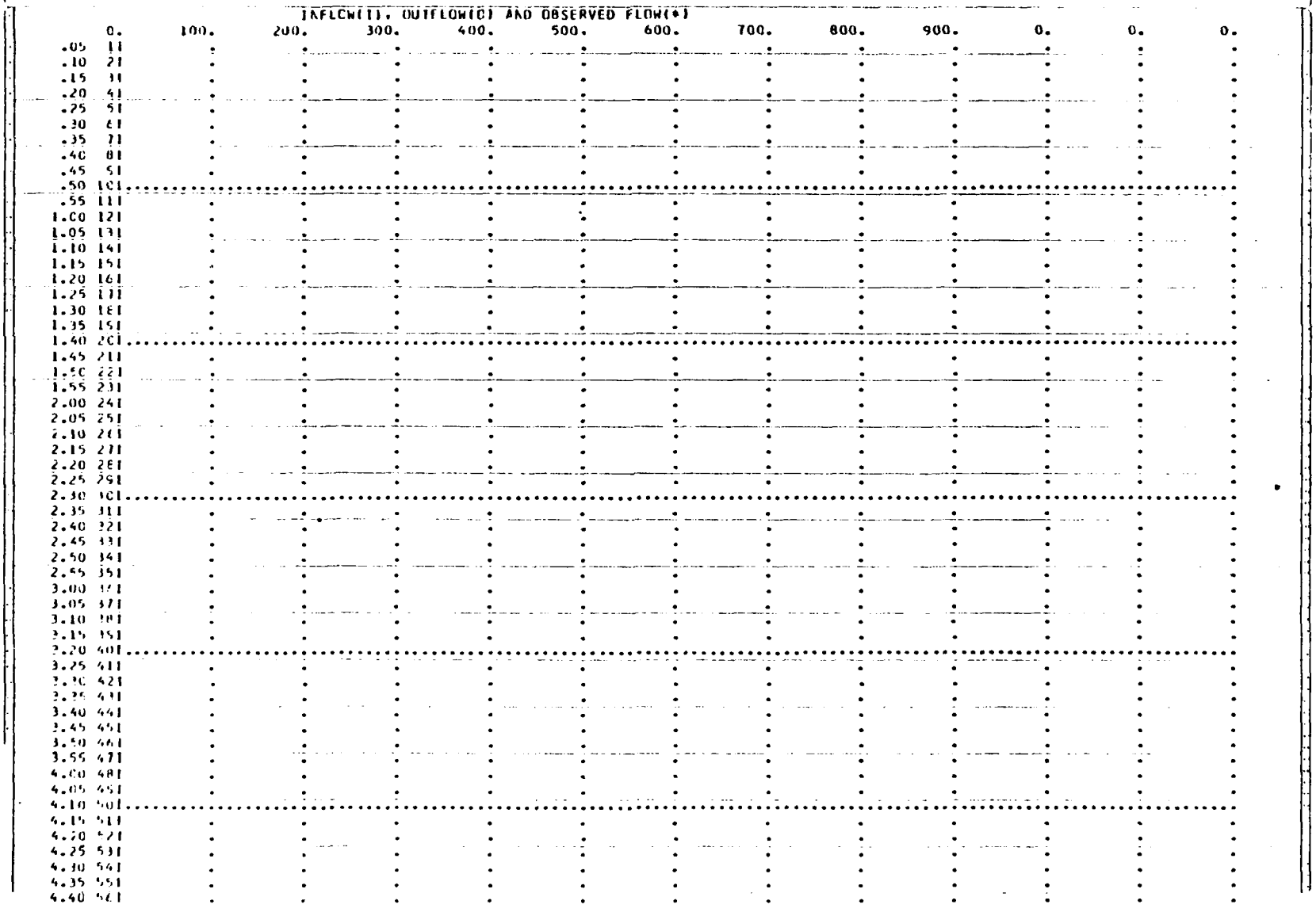
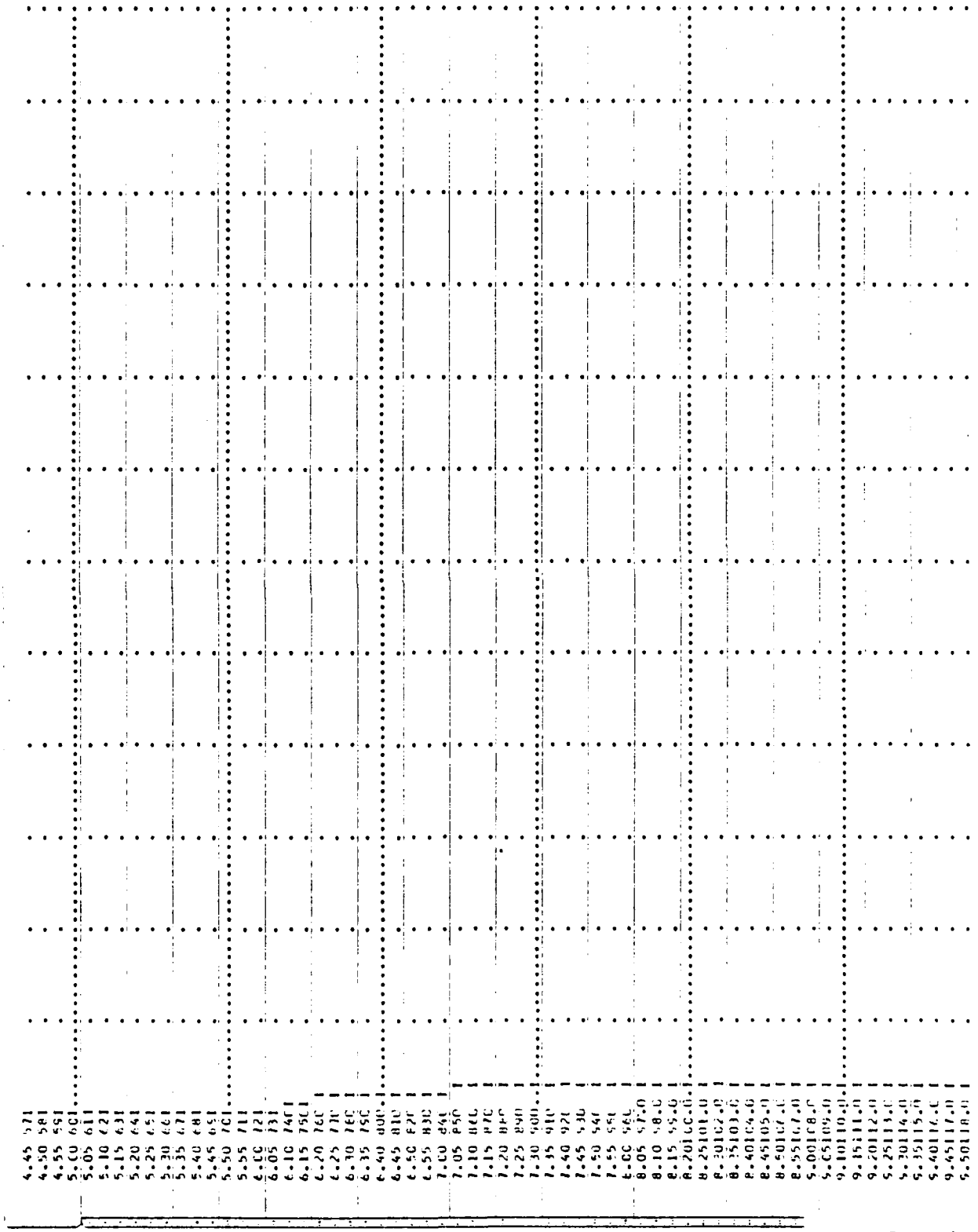


PLATE D-13



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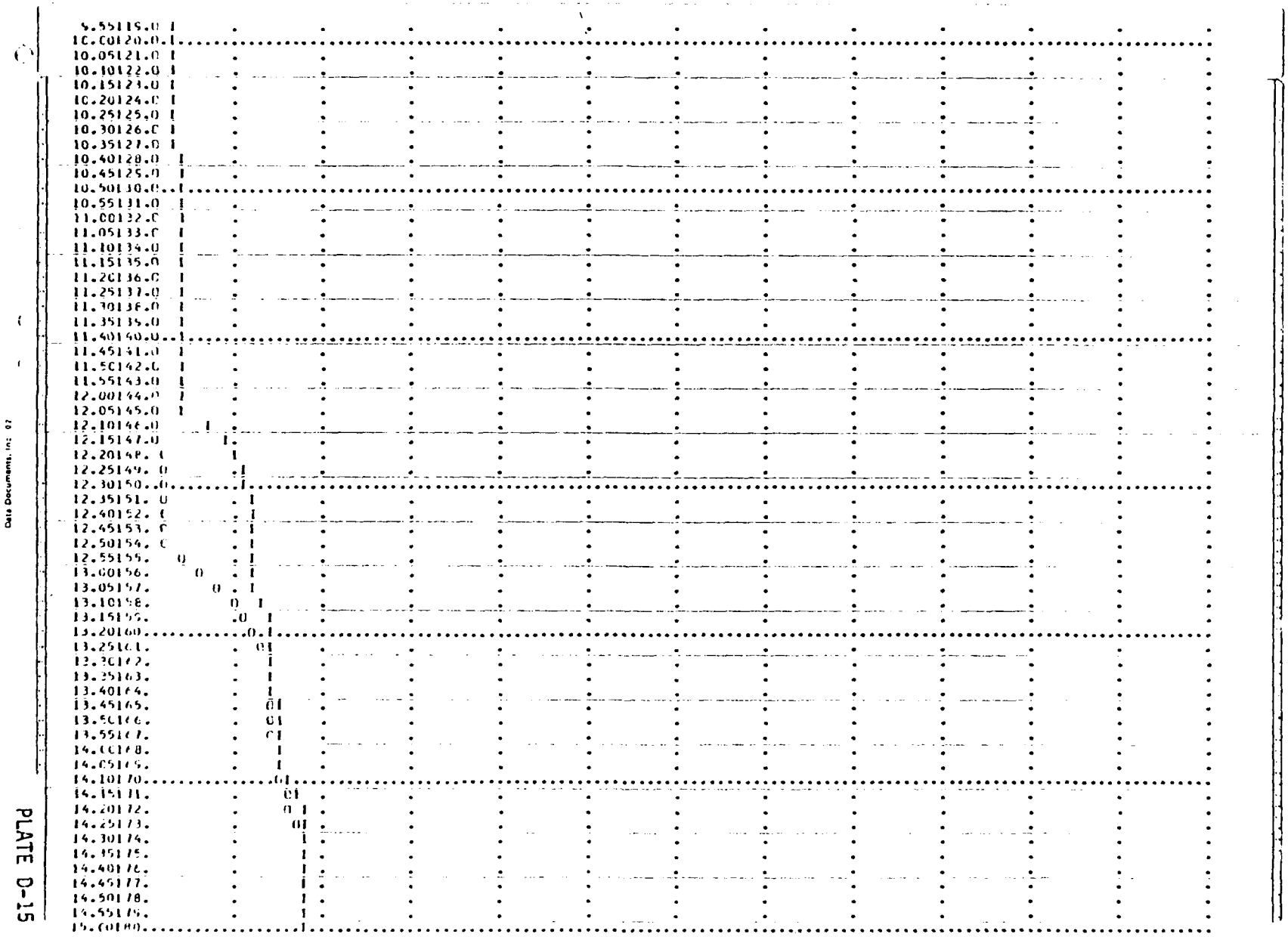

PLATE D-15

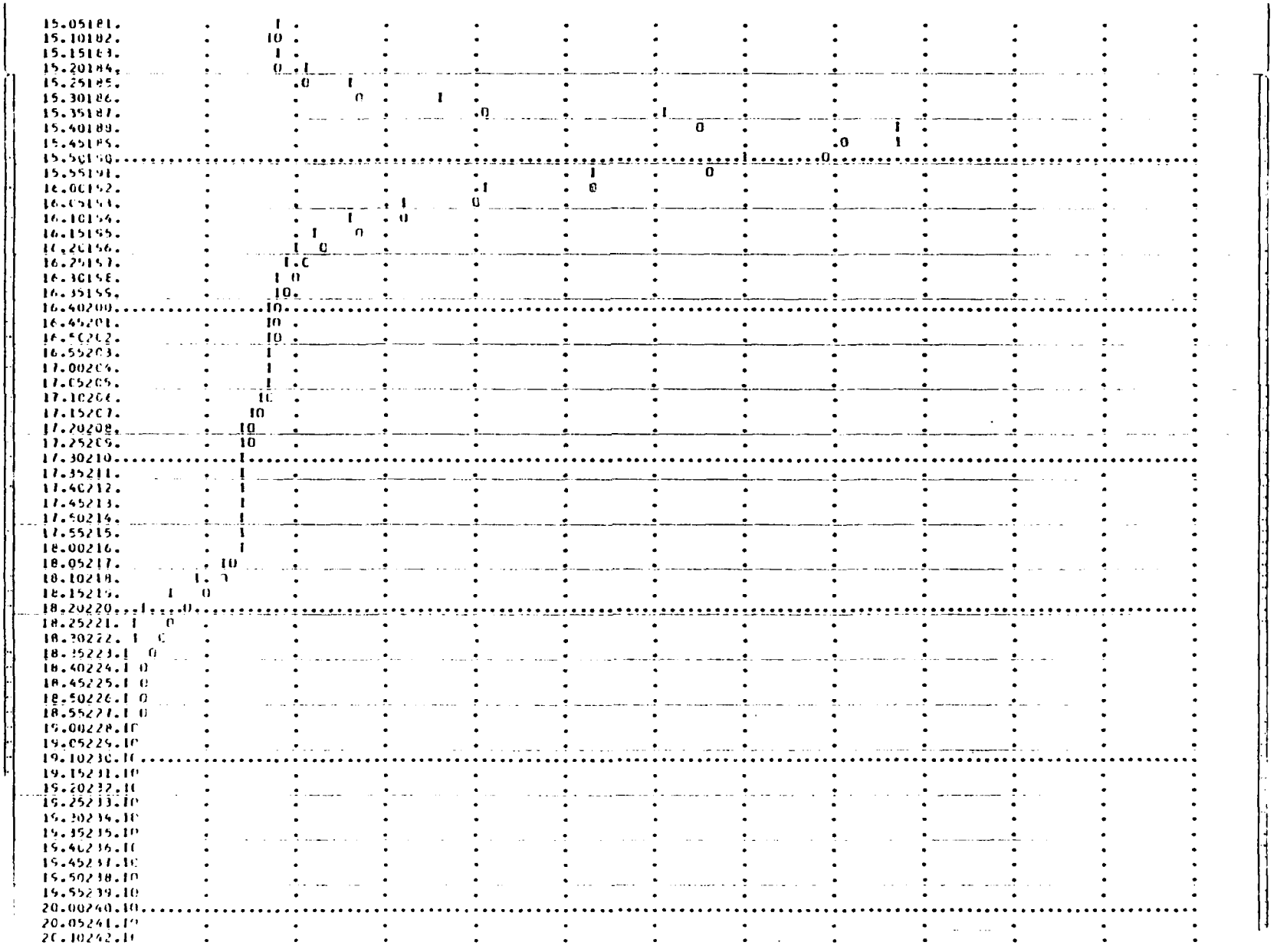

PLATE D-16

PLATE D-17

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS								
				RATIO 1 .05	RATIO 2 .10	RATIO 3 .15	RATIO 4 .20	RATIO 5 .35	RATIO 6 .50	RATIO 7 .65	RATIO 8 .80	RATIO 9 1.00
HYDROGRAPH AT	000001	.15	1	87.	174.	261.	348.	609.	870.	1131.	1392.	1740.
		(.39)		(2.46)(	4.93)(	7.39)(	9.85)(	17.24)(	24.63)(	32.02)(	39.41)(	49.26)
ROUTED TO	000002	.15	1	11.	21.	139.	303.	565.	812.	1080.	1360.	1733.
		(.39)		(.32)(	.60)(	3.94)(	8.58)(	16.00)(	22.99)(	30.57)(	38.51)(	49.07)

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	756.60	756.60	759.70
STORAGE	0.	0.	14.
OUTFLOW	0.	0.	16.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.05	758.67	0.00	8.	11.	0.00	18.08	0.00
.10	760.16	.46	17.	21.	4.58	18.17	0.00
.15	760.52	.82	19.	139.	5.58	16.00	0.00
.20	760.76	1.06	21.	303.	6.75	15.83	0.00
.35	761.02	1.32	22.	565.	9.42	15.75	0.00
.50	761.21	1.51	24.	812.	11.58	15.75	0.00
.65	761.37	1.67	25.	1080.	12.50	15.75	0.00
.80	761.52	1.82	26.	1360.	13.58	15.75	0.00
1.00	761.68	1.98	27.	1733.	14.42	15.75	0.00